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JOURNEY ALONG THE WEST COAST OF SOUTH AMERICA, FROM PANAMA TO VALPARAISO.

BY JAMES DOUGLAS, JR.,

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It was in midwinter that I left the St. Lawrence, then bound in ice, for the tropics. Within a fortnight I had passed from Quebec and its citadel, wreathed in snowdrifts, to Panama and its old ramparts, decaying under a shroud of rank vegetation. In the passage I had crossed the track of Columbus' first memorable voyage to America ; had enjoyed ravishing glimpses of those three brightest jewels in the coronet of the Antilles, Cuba, St. Domingo and Jamaica ; had revelled in the fruit markets of Kingston ; been tossed by the trade winds on the Caribbean ; enjoyed a stroll along the coral-strewn beach of the Isthmus, and been whirled by steam through its luxuriant forest to the Pacific—such marvellously rapid transformations in the surroundings of life does steam make possible !

On approaching Aspinwall from the Caribbean, there rises on the horizon a low line of dense brushwood, which invades the very sea, leaving only here and there a narrow strip of beach, white with the disintegrated remains of coral reefs. Looking northward, this low coastline stretches past the mouth of the Chagres River till it merges into the watery horizon ; southward it terminates in the bold promontory of Porto Bello. Ahead opens out Navy Bay, the old Bahia de Naas, at the foot of which, on the Island of Manzanilla, stands Aspinwall, the sad and dingy realization of so many bright dreams of colonization. In Porto Bello and Aspinwall we have typical examples of old and new ports of transit. In Porto Bello Columbus cast anchor in 1502. As soon as a Pacific trade sprang up an Atlantic port of shipment became necessary, and Porto Bello, being the best harbor on the coast, was selected as the site of a commercial mart in the reign of Philip II. Thither for nearly two

centuries the galleons of old Spain carried the merchandize of Europe, to be exchanged for the rich products of the Pacific. On the news of the arrival of the fleet reaching Panama, the merchants of the West Coast, who were awaiting it, flocked to Porto Bello. During the forty days that the fair lasted, Porto Bello was the most active, licentious and pestilential spot in the new world. At length the fleet sailed, and the merchants hurried away with their freight, some carrying it to Panama over the good high road that crossed the Isthmus, others transporting it by sea to the mouth of the Chagres, and by that rapid river to Cruces, from which a well-paved road of less than twenty miles lead over the backbone of the Isthmus to Panama. Porto Bello remains, in the empty substantial stone buildings which old Spain erected to accommodate her commerce. Chagres and Cruces are no more. Aspinwall sprang up in a day, and overshadowed them with her flimsy wooden barracks, and vies with them in immorality and filth. But the town has no commercial importance ; nothing is bought or sold in it. Fleets of steamships arrive and discharge their cargoes directly into the cars of the Panama Railroad and depart. Steam handles everything, and therefore almost the only occupation of the people is to cater to the vices of the crews. The visitor cannot but feel how vain were poor Paterson's hopes. It was not far from Navy Bay that the adventurers of the Darien expedition landed in 1698, and laid themselves down to die within a twelvemonth, instead of founding a colony which should stretch from the Atlantic to the Pacific, and monopolize the trade of two worlds—a colony in which religious equality and free trade were to be the fundamental principles of social and commercial life. Colon is less unhealthy than it was; the mere clearance of some of the surrounding brushwood, and the filling up, though only with decaying rubbish, of some swampy ground, having notably improved its sanitary condition. Paterson's commercial metropolis might therefore have stood the ravages of climate, but it could not have survived the deflection of trade from the Isthmus which gradually took place during the 18th century. By 1748, however, the products of the coast were carried to Europe so exclusively by sea, without transhipment, that the fleet of galleons ceased to make its annual voyage to Porto Bello, and

Panama and that Atlantic Port lost their commercial importance, never to regain it.

For a century the Isthmus was deserted, but in 1849 the gold discoveries in California attracted to the west coast of North America most of the worthless population of the East. Week after week there were then discharged at the mouth of the Chagres River shiploads of the most reckless spirits of both continents. These forced their way towards the land of gold and lawlessness over this disused avenue of ancient commerce, many of them impelled by a love of riot and rapine as fierce as that which carried the buccaneers who followed Morgan up the same stream to the sack of Panama.

To accommodate the California trade, the Panama Railroad was commenced in 1850, and completed in 1855 ; and thenceforward the traveler to the Pacific has crossed from sea to sea in fewer hours than it formerly took days, and has enjoyed the luxury of tropical scenery without undergoing the usual discomforts of tropical travel. And a glorious sight it is, this wealth of vegetation which covers the Isthmus. The train moves through a trench cut out of a dense forest. Conspicuous amongst the trees are palms of so many varieties that the mind marvels at the resources of nature which can modify so profusely a typical form without losing the clue ; to relieve the deeper color of the palm, the banana shoots forth its clusters of vividly green leaves, and the canes rear their tufted stems in graceful groups to a height of 50 feet and more, while high above all the cotton trees rise like faultless columns crowned with a capital of branches. These ancient denizens of the forest are festooned, trunk and branch, with creepers and rare orchids, which still cling to and beautify their leafless limbs after they have sapped all life from them. It was from the top of one of these towers of observation, on the summit of the low ridge of 265 feet to which the Rocky Mountains and Andes have here sunk, that Drake first saw the Pacific in 1572, "and besought Almighty God of His goodness to give him life and leave to sail once an English ship upon that sea."

But like all luscious things, tropical vegetation, where as luxuriant as on the Isthmus, soon palls upon the senses, and the eye seeks longingly among the rounded masses of brilliant color for points and angles, and bare stems, and the beautiful intricacies of branch

and branchlet, and twigs, and for the neutral tints of stocks and stones; but it seeks in vain :—and we decide that our northern landscape and our northern climate are healthier for the mind and for the body. Nevertheless, the railroad drive across the Isthmus must remain a bright spot in the memory of every one who has taken it, even if he has been familiar with the tropics elsewhere; and it is to be wondered at that all of those who go to California for pleasure do not select this route, so full of beauty and historical interest, in preference to the overland, in either going or returning.

The story of the Isthmian Railroad has been often told, and I shall not repeat it.

It lands its passengers outside the town of Panama, and as the Californian steamer is usually lying in the bay with steam up, those bound north are carried away at once by the tender, and denied the privilege of spending a dollar in the town. Those of us whose destination lay southward, had to wait for the arrival in Aspinwall of the West India Company's boat with the English mails.

Panama has a history, but like many another place famous in the past as a commercial centre, it is yielding its importance to other cities, better situated to meet the requirements of modern trade. Its site was seized upon by the earliest Spanish adventurers on the Pacific as a most eligible centre from which to explore the West Coast. Its foundation, therefore, dates back to 1519. At once the little colony became the scene of active preparation for both peaceful and hostile expeditions. Only five years after its foundation, Pizarro sailed out of it on his first daring voyage to the land of the Incas. It prospered so rapidly that a century later it contained 12,000 dwellings and 8 monasteries, and was reputed to be such a treasure house that it tempted Morgan and his company of buccaneers to cross the Isthmus and undertake its capture. How much they suffered in the attempt, how wonderfully they succeeded, and yet how woefully they were disappointed in their expectations, is one of the stock stories of the Spanish Main. As one stands on the ramparts of the present town, there can be seen rising above the trees, some miles distant to the eastward, a solitary tower. It is all that remains of the town Morgan sacked. When he and his dissolute crew had retired to quarrel over their scanty spoils, it was determined to build a town which would be proof against any other such assault, and for its site a point of land to the west jutting

boldly out into the bay, was chosen. To protect the town landwards, a deep trench was dug, and seaward, on three sides, strong walls were built upon the steep though not high rock. Jesuit, Dominican, Franciscan, took up their abode in the new town, and as usual occupied not a little of the narrow peninsula with churches, monasteries and colleges, whose remains still exist and testify to the wealth, ambition and artistic tastes of their builders.

Panama continued to prosper till towards the middle of the last century, when the trade of her colonies with old Spain had become so large as to necessitate other outlets than the Isthmus, and, the passage of Cape Horn having lost its terrors, commerce was deflected from Panama by the Cape to the old world. A temporary revival was brought about by the hosts of Californian immigrants who, before the railroad was built, were detained for days in the town. But the opening of the railroad, and correspondence between the Atlantic and the Pacific branches of the Pacific Mail Company's line, robbed the Isthmus of all benefit from the passenger traffic. At length the death-blow was given to Panama by two causes, working almost contemporaneously—one, the building and opening of the Central and Union Pacific Railroad, which withdrew from Panama much of the trade of China and Japan, and the Californian traffic; the other, the establishment by the British Pacific Steam Navigation Company of a line of steamers running direct from the South American ports on the West Coast to Liverpool. Prior to that time, the Pacific Steam Navigation Company, which does most of the trade of the West Coast, had gathered all its freight at Panama, transported it across the Isthmus by the Panama Railroad, and handed it over to the different lines of European steamers to be carried to England, France and Germany. But owing to a disagreement with the Panama Railroad about freights, they determined to try the experiment of a line of steamers from Callao and Valparaiso to England direct. The experiment succeeded, and thenceforward most of the transit trade, which they formerly brought to Panama, has been diverted. It was just a century previous that improvements in navigation opened direct trade with Europe by Cape Horn, to the detriment of the Isthmus.

Panama is a ruin. The fosse is now hardly recognizable as artificial, so filled is it with trees and creepers, and the old walls are falling in picturesque heaps into the sea. One portion of the fortification is kept in tolerable repair, for the bomb-proofs beneath the

ramparts are used as prisons, which the Government finds it necessary to keep sound, whatever else may fall to ruin. This bastion is the evening promenade of the Panamenos, and few cities in the Old World can boast of a view more full of human interest and beautiful scenes than this. In the evening the cool sea breeze sets inland with the sunset, the blazing heat of the day at once falls to a delicious temperature, and the fierce light of the midday sun no longer dazzles the eye. The varying distance of the numberless islands which stud the bay gives a distinctive beauty to each group. The Pearl Islands look like banks of gilded cloud in the far distance, just resting on the horizon. Other islands, such as Perico and Flaminco, near at hand, float on the placid water like rafts of verdure. Landward, we look across the shallow bay which separates the rampart from the town, and watch the waning light flitting from the crumbling fortification to the finely proportioned towers of the ruined Dominican convent, and the gables and walls of the Franciscan, and the façade of the old cathedral, all of which rise high above the crumbling buildings of the new town; till the city is lost in darkness and the shadows of the night creep up the sides of the hill Ancon that forms so appropriate a background. It is disenchanting to return homeward between the rows of drinking booths which line the streets, and meet the night patrol of truculent soldiers, accompanied by a band blowing discordant sounds.

Panama is not a pleasant place of residence. Though by no means so unhealthy as supposed, it is long before a European becomes reconciled to the climate. One can bear patiently a temperature of 80° for a day, or even for two or three, when certain that it will not last, and that in six months one will be cool enough; but a feeling of despair creeps over you as day follows day, and the same horrible heat continues, and you come to experience—what no telling can ever make you feel the full meaning of—that summer and winter are of the same temperature in the neighborhood of the equator, and that it will never be cool.

Another drawback to living in Panama is the intense heat of the political atmosphere; for Panama is almost constantly in a state of revolution, and it is not by any manner of means pleasant to live in a bomb-shell with the fuse lighted. The population of the Isthmus has become almost exclusively black. Formerly, of course, the influential ingredient was Spanish, but gradually the West Indies have transferred to the Isthmus more and more of their negroes.

In politics they are without exception liberal, radically so. In 1861 the liberals came to the surface, and the blacks therefore came into power. Their treatment of the religious communities was so extremely objectionable that the clergy left in a body, and for a time none of the rites of religion were performed in Panama, and the city lay under the ban of the church. Strange to say, the blacks of the Isthmus (and this is very much the case elsewhere) do not seem to have been deeply influenced by the Roman Catholic religion, although its ritual might have been supposed to attract them. It may be that it does not give sufficient scope to the individuality of the negro, or it may be that, Roman Catholicism and revolution not being compatible, and the inhabitants of the Isthmus having always the choice, invariably prefer revolution to religion.

After several days' delay the arrival of the English mail was announced, and we embarked on the tender of the Pacific Steam Navigation Company, which transferred us to the S. S. *Chile*. The shores of the bay are so shallow that a long pier reaches water only of sufficient depth to float boats of light draft. A double handling of freight is thus incurred.

As already remarked, the Pacific Steam Navigation Company almost monopolizes the freight and passenger traffic of the West Coast of South America. It has three systems of boats ; first, a large fleet of very small side-wheelers, which run to every inlet and roadstead. These collect the freight and congregate it at certain centres, where a second class of boats, most of them also with paddles, of somewhat larger calibre, picks it up and discharges it at Callao, Arica, Iquique, Valparaiso or Concepcion. These are commodious ports, into which the large European screw steamers can enter, and where they can load. By this intricate system they manage to control effectively the whole trade of the coast. A Chilian line of steamers was during my stay on the Coast run in opposition, from Valparaiso to Arica. It has since been absorbed by the P. S. N. Co., but a more formidable rival has sprung up in a line of large boats trading between Germany and the Coast. Without the freight fed to the main line by smaller vessels, no line of steamers stopping merely at the larger ports on the coast, can, however, derive full benefit from the trade.

The following extract from the Time-Table of the Main Line from Panama to Valparaiso enumerates the ports of call of the second class boats in 1871 :

Ports of Call.		Date.			Remarks.
Leave	Panama,	Jan'y 1st,	Lat.	8.0 N.	New Granada.
Arrive at	Guayaquil,	" 4th,	"	2.10 S.	Principal port of Equador.
"	Payta,	" 5th,	"	5.03 S.	In Peru, within the desert zone. Terminus of the Piura R. R.
"	Callao,	" 7th,	"	12.02 S.	Port of Lima & Pacific terminus of Aroya R. R.
Leave	Callao,	" 9th,			
Arrive at	Tambo de Mora,	" 10th,	"	13.50 S.	All these hamlets on this arid coast are upon open roadsteads, where are shipped the fruits, wines, and products of the river valleys of the interior.
"	Pisco,				
"	Lomas,				
"	Chala,	" 11th,			
"	Atico,				
"	Quilca,				
"	Islay,	" 12th,	"	16.50 S.	Formerly the port of Arequipa.
"	Mollendo,	" 12th,	"	16.06 S.	Pacific terminus of Arequipa R. R.
"	Ilo,	" 12th,	"	17.28 S.	Pacific terminus of Ilo and Moquegua R. R.
"	Arica,	" 13th,	"	18.23 S.	Pacific terminus of Tacna R. R. Though in Peru, it is the principal port of shipment for Bolivia.
"	Pisagua,	" 14th,		..	Exports nitre only.
"	Mejillones,	" 14th,		..	Exports nitre only.
"	Iquique,	" 14th,	"	20.10 S.	A short R. R. ascends to the nitre beds on the Pampas above and behind this portion of the coast.
"	Tocopilla,	" 15th,	"	22.00 S.	In Bolivia ; first copper furnaces.
"	Cobija,	" 15th,	"	22.28 S.	Principal port of Bolivia.
Leave	Cobija,	" 15th,			
Arrive at	Mejillones, de Bolivia,	..	"	23.2 S.	The Nitre beds extend southward on the Pampas through the territory in dispute between Chile and Bolivia into Chile proper. Guano occurs on the headlands.
"	Antofogasta,	..		..	R. R. to the silver mines of Caracoles.
"	Pan de Azucar,	..		..	Copper furnaces and mines on the coast and in the interior.
"	Chanaral,	" 16th,	"	26.21 S.	Terminus of R. R. from Salido copper mines.
"	Caldera,	" 16th,	"	27.5 S.	Terminus of Copiopo R. R. ; scant vegetation.
"	Carrizal Bajo,	" 17th,	"	28.05 S.	Terminus of Carrizal, Alto and Carro Blanco Mineral R. R.
"	Huasco,	" 17th,	"	28.27 S.	At the mouth of the Huasco River, the first Chilean river which reaches the sea.
"	Coquimbo,	" 18th,	"	29.37 S.	Copper Smelting ; terminus of Coquimbo R. R.
"	Valparaiso,	" 19th,	"	33.66 S.	

Our course lay S. S. W. across the Bay of Panama, towards the most westerly headland of Ecuador, for there are few ports of consequence in New Granada, and what little merchandize was then gathered from such as exist, was carried by the small boats to Panama. Once out at sea, it became so cool that cloth clothes were necessary during the day and a great-coat was not amiss when the sun had set. After two days' steaming we dimly sighted Cape San Francisco, and the next day rounded Cape Santa Elena, a bold bluff running squarely out of a low sandy spit, and entered the Gulf of Guayaquil. Upon rounding the island of Puna, we found ourselves between the low, heavily wooded shores of the Guayaquil River. The island of Puna rises like a cone so uniformly from a level sandy beach, that after sailing round it you cannot be sure you have looked at it from opposite sides. On it Pizarro organized his little band, and along the sandy beach on which we saw the sun beating with a terrible glare, he and his armor-clad men plodded before crossing over to Tumbez, situated on a projecting promontory of the mainland, to the south, whence he marched into the interior.

It was evening when we entered the river, and before daylight we cast anchor opposite the town of Guayaquil. Immediately the steamer was surrounded by a fleet of canoes and rafts (*balsas*), from which streamed crowds of men and women, noisily loading our decks from stem to stern with fruits for the Lima markets—and such fruits! The very quarter-deck was piled with oranges, plantains, pomegranates and cactus fruit, and from every bar and beam hung bananas of half a dozen different varieties. Besides these well known fruits, were *paltas*, or alligator-pears, and *mangos*, both *morado* (purple), and *amarillo* (yellow), more tempting to the eye than is the peach, but less savory to the tongue; and the flavorless and watery *nisperos*, with its rough brown skin, as inviting as a russet, but not as true to its appearance; and the *memeyo*, only a little less flavorless than the *nisperos*. But more abundant than these was the favorite fruit, the *guava* (or *pacay*), a large black bean of mawkish sweetness, covered with a slimy down, and enveloped in a pod 2 feet long. Tropical fruit is beautiful to look at, but if we except the pineapple, incomparably inferior in flavor to that of the temperate zone. Even the famous *chirimoyo*, or custard apple, though more luscious, is to northern taste less delicious than a strawberry or a peach.

When each group of Indians had embarked their own consign-

Coquimbo, 18th, 29 37 S. River which reaches the sea.
Valparaiso, " 19th, 33 66 S. Copper Smelting; terminus of Coquimbo R. R.

ment, one or more men and women settled themselves on the deck, beside each pile, to accompany their goods to Lima. But in addition to their fruits, most had with them monkeys, parrots, paroquets, and a few even beautiful specimens of the puma, or South American tiger, which their owners fondled as we would a cat. Our decks, therefore, assumed an aspect very unlike what we are accustomed to on an ocean steamer.

Guayaquil looked most attractive from the boat. Up and down the river the bank was lined with canoes and rafts, laden with the products of the upper country, each raft carrying a picturesque thatched hut, the home of the boat-man. Along the shore stretched a long row of three-storied wooden houses, the second story protruding, and supported by a colonnade, so as to make a covered arcade over the footpath. The street terminates at the hillock of Santa Anna, from which springs a semicircle of low hills, that rise behind and above the town with graceful broken outlines. But all the attraction is confined to the river frontage. The streets elsewhere are a maze of channels of mud more or less liquid, according to the season; through which you pick your way along a narrow ridge of stones, which sometimes follows the middle, sometimes one or other side of the thoroughfare; and if you are tempted by the banana leaves and cocoa palms overhanging the reed fences, to seek refuge from the smell by entering an enclosure, you find pigs and children wallowing together there, in a filth through which there are no stepping-stones. The characteristic building material of Guayaquil is the bamboo, which grows too many inches in thickness, and which, when cut partially through longitudinally at distances of an inch or so, and once quite through, can be opened out into firm elastic boards of serviceable width. Houses and even churches of a certain primitive beauty are built of such reeds, so bound together with cords that few nails enter into the construction, and which therefore yield so readily to the contortions of the earth during an earthquake as to be comparatively safe.

Garcia Morena was dictator, or nominally President, during my visit. He was a wealthy man, above need, which tempts to peculation; who ruled the people with a rod of iron, but all for their good, though none the less to his own satisfaction—under whom the exports and imports notably increased, and at whose command a certain gloss of morality came to be spread over official life;

who introduced the Jesuits to reform the Church, and finally paid the penalty of his severity and patriotism by his life. Equador has a population of a million, more or less, principally Indians and Negroes, altogether unfit for constitutional government, as Garcia Morena well knew. The province of Guayaquil is as fertile as the Delta of the Nile, and the whole country wooded to the snow line of the Cordilleras. Its resources are infinite, but difficult of development, from climatic and ethnological causes; nevertheless it produces large quantities annually of coffee, cocoa, chincona bark, sarsaparilla, india-rubber and ornamental woods.

During the afternoon we returned down the river and had time to study our deck load of fruits and natives. Indian physiognomy is essentially the same south and north of the Isthmus. In Equador a custom exists, a remnant perhaps of the Inca practice of mummying the dead, of compressing into a small compass and drying for preservation the head of the deceased. I saw one specimen, procured by an English lady, from the interior. It was the head of a full grown person, reduced in diameter from ear to ear to about three inches. The shape of the skull was well retained; but the proportion between its size and that of the ears and nose, which were somewhat too large, was not well maintained. A profusion of long black hair rose slightly in a dense mass from the shrunken scalp, and falling in a thick curtain, nearly two feet long, over the head and face, had to be thrown aside to display the withered features, tanned to a light brown color, not much deeper than the native hue. It was perfectly inodorous. As these relics of the dead are sacredly preserved, it is difficult to obtain them.

When darkness shut out the view we were steaming between banks covered with dense vegetation. When we awoke next morning we were sailing under a perfectly desert coast. We had entered the region of the S. E. trades, and with the first glimpse of the Andes we were witnessing the effect of their influence. This vast mountain range is the prominent feature of the South American continent. It gives expression to its scenery, and by its influence on the climate and country in great measure determines the character and social habits of the people. The main chain follows so closely the West Coast line, that at Guayaquil, 120 miles south of the equator, in fine weather, the towering peak of Chimborazo may be seen; from Arica, 960 miles further south, Mount Soroto on the

shores of Lake Titicaca is often discernable, and Aconcagua is a landmark to the mariner making Valparaiso, 900 miles still further to the south. The S. E. trades crossing the continent, charged with moisture from the Atlantic, meet the cold barrier of the Andes, and precipitate their watery burden on its eastern flank, yielding exuberant wealth of fertility to the *llanos* of Venezuela, to the *sylvas* of the Oronoco and Brazil, and to parts of the *pampas* of the Argentine Republic, though at the expense of the narrow strip of country between the Cordillera and the Pacific. Within the area of these invariable winds, that is, from a little south of the Guayaquil River to Central Chile, or for a distance of 1,800 miles, rain either never falls, or is a more startling phenomenon than an earthquake. The rivers therefore are small, not only because from their source in the Andes to where the last drop is absorbed by the thirsty sand, not an affluent joins them, but also because even the higher portions of the Western slope of the Andes are so scantity clad with snow, that the rivers have but a small store of nourishment to draw from. The southern limit of the trades is not so sharply marked by the ardity of the coast as is the northern, for in sailing from Caldera, in Chile, southward to Concepcion, along 550 miles of coast, one passes from a desert where rain does not fall for years together, thence along a coast where summer showers are unknown, though winter rain storms occasionally occur, to a climate as humid as that of Ireland itself. At this, the southern end of the desert strip, there is, therefore, no violent transition from sterility to fertility.

About noon of the day following our departure from Guayaquil, we passed Cape Blanco, which bounds the Gulf of Guayaquil to the south. The coast here is remarkably bold, steep cliffs from 500 to 800 feet high forming a barrier to the sea and presenting beautiful instances of distorted stratification. Where a gap in the wall occurs, the sand streams down from the desert behind like yellow glaciers. Over the cliffs we could see the tops of the first range of the Andes, to whose base the desert stretches, except along the few river valleys. Between Cape Blanco and Cape Parena, the most westerly point in South America, the cliffs lose their precipitous character, and become high sandy hills, strewn with torn masses of rock ; and before reaching Paita the coast line appears quite low, but out of the sandy sea arises here and there an isolated rock mass.

At dusk we cast anchor in the open roadstead of Paita, a town without a drop of drinking water within 20 miles, but the outlet of a rich back country, and once a place of great importance. For, as the trades are here entered, the fleet sailing South in days of yore, with its cargo of European goods, discharged them at this point, to be tranported hence by land to their destinations. In the teeth of the trades, it was a quick passage when the 140 leagues to Callao were made in fifty days. Don Jorge Juan tells of a captain who married on the eve of his departure from Paita, but ere he reached Callao had become the father of a son old enough to read. It is now the terminus of a short line of railroad to Piura, 45 miles distant, the centre of the rich inland district which sent us for transport to Lima, 100 tons more fruit, besides cotton, and 110 head of cattle. These were unceremoniously hoisted on deck from the *balsas* alongside, by a rope slung over their horns. Rich as the back country is, the area of fertility is much smaller than when the Spaniards subjugated the Incas, for a most perfect system of irrigation then carried the water from the river beds at their discharge from the gorges of the Cordilleras over the plain, and maintained as a garden what has since relapsed into a desert. The old aqueducts remain, but the rivers have worn their beds to a depth below the canal levels. The canal from the Santa Clara river, for instance, is nearly three feet above the present water-course. Attempts are, however, being made to restore to cultivation part of the sandy waste, and thus increase the area of arable land, now too small to supply the wants of the population.

Paita boasts of a quay and an iron Custom-House ; besides these, a few irregular streets, lined with mud or cane houses, compose the town. A low range of sandy hills overlook it and the sandy cemetery. It was after dark when I landed. The population was lying on mats in the streets, a pleasanter sleeping-place than the hot houses. Those who had no mats were making themselves comfortable in the deep dust and sand. It looked like a city of the dead, for those who did not strew the streets were moving about at funeral pace, the women enveloped in black *mantos* which concealed face and figure. One's thoughts travelled back to 1741, when at dead of night the dreary town was startled into unwonted activity by the landing of forty men from the long boat of Anson's ship, the

Centurion. A panic spreading, and the whole population fled, half clad, to the hills, leaving their town a prey to the enemy.

A sail of about forty hours carried us to Callao. The coast lay generally too distant to be distinctly seen. It is low, and its hillocks of sand remind you of the dunes of Holland. We passed inside the Lobos, a northern group of guano islands, whose stores were being kept in reserve. On the evening before reaching Callao, we had our first view of the snowy peaks of the second or main chain of the Andes, rising above the high coast range. They looked like heaps of burning coals or burnished brass. The sun sank majestically below the horizon, the sea rapidly engulfing it, but the mountain tops received its rays for at least four minutes after we had lost sight of the upper limb of its orb. It was twenty-five minutes after sunset before Venus travelled forth, and ten minutes more before it was dark. Every day the trade winds blew a gentle breeze from the S S. E., ruffling the water; but at night we sailed over a sea of glass.

We entered Callao harbor, between the main land and the north end of the Island of San Lorenzo, which closes in the bay from the sea sufficiently to entitle Callao to the name of a harbour. At the foot of the bay lies the town, of low squalid buildings, square roofed and without any feature of beauty ; and above them can just be distinguished the circular wall of the castle Real Felipe, famous in the eyes of Englishmen for its resistance to Lord Cochrane. But other signs of Anglo-Saxon influence over the destinies of South America are seen in the British and American frigates, which side by side overlook the town; in the large fleet of their merchant ships, rocking at anchor in the bay ; but still more conspicuously in the many boats of the Pacific Steam Navigation Company, and their large works, employing 2,000 hands. Landward, ever the low lying town, can be seen in the distance the top of the hill San Christobel and the towers of Lima, backed close at hand by spurs of the coast range, which here contracts the sea-shore plain to seven miles or so.

Once off the water, we plunged into dirty streets, reeking with the filth thrown out of dirtier houses, paved with round cobbles or deep with dust, and traversed by open sewers. In dingy shops, dingier than a ship chandler's in the East of London, we find the places of business of important firms, and if we need the accommo-

dations of a hotel we shall probably be stowed away in a dark closet. But houses of Guayaquil reeds plastered with mud are not without their advantages under certain circumstances. In the bombardment of the town by the Spanish fleet in 1868, these houses discomfited the enemy more effectually than did the forts, for it was a waste of ammunition and a trial of patience to fire at them. When a shot struck, the elastic walls parted, gave it passage and closed again as if welcoming it in.

A railroad, the first built in South America, connects Callao with Lima, only seven miles distant inland. Side by side with the railroad is the old cart road, still as largely used as ever, for so strong was the influence of the guild of carters, that a charter to build the road could be obtained only on condition that it carry nothing but passengers and a few privileged articles of freight. The rest of the traffic between the capital and its port is still, as of old, carried over the sandy road.

The drive reminded me faintly of that from Boulak to Cairo. There are the same rows of trees planted in ditches cased with stone to convey water to their roots ; the gardens and fields inclosed with walls of unburnt brick, artifically irrigated; the strings of donkeys plodding or trotting through a cloud of sand and the sandy desert stretching beyond the narrow limits of cultivation to the yellow hills. Even the pyramids have their representatives in a group of the old sepulchral mounds, the *guacos*, one or two of them built in steps and in cubic contents not much inferior to the pyramid of Cheops ; and the resemblance to Egypt is heightened by the smell, not the bad smell of decaying animal or vegetable matter, which whether in dry or moist climates is the same and too strong to be distinctive, but a smell indescribable, yet which, when once perceived, never can be forgotten, and which most vividly associates together in the mind of the traveller the habitable scenes of all hot arid regions.

Lima is not a city to be described in a paragraph. As it stands to-day, it is the meeting point of the old Spanish colonial system and of the new republican ideas and practices ; and the heterogeneous mixture of the old and the new in society and government, and the baneful influence of the past on the present, make Lima and its inhabitants a study of special interest. It was founded by Pizarro, and became, what he intended it should be, the centre of Spanish

rule in the new world. There the viceroys of Spain maintained viceregal state, and governed with the aid of a small body of pure Spanish office-holders, who, free from the control of Madrid, enriched themselves at the country's expense, and spread corruption through every province of government—corruption which unfortunately has been inherited by their successors under the Republic, and has added another to the many unhealthy influences which have tended to mar hitherto the experiment of free government in Spanish America.

In Lima, one likewise sees in the exuberantly florid architecture of the churches, built at enormous cost, in connection with monasteries almost as extensive and extravagant as those of Old Spain, and still more in the gloomy building of the Inquisition, a most demonstrative proof of the power and wealth of the Church in days gone by, and of how it used them ; and to-day one sees no less palpably, in the carelessness and irreverence with which the public services are performed in those same churches, and the undisguised immorality of the clergy, a significant instance of the decline in religious fervor to which luxury and irresponsible power lead.

The ecclesiastical architecture is hideous in the extreme, contrived by its display of color and bedizenment of sculptured ornament to attract the Indian eye; but the domestic architecture, with its dash of the Moorish, conspicuous in the enclosed balconies of exquisitely carved wood-work protruding from the second stories, so as to shade the streets, is pleasing in the extreme. To build high houses would be to erect structures for the first earthquake to make sport of, and, therefore, in order to obtain space, safety and comfort, the houses of the wealthy surround court after court, filled with flowers and cooled with fountains, connected one with another by wide passages which give a vista from garden to garden. The street gate is generally open, for the Limenos are not exclusive, and therefore the passenger in the street enjoys as well as the inmate the refreshing view.

But the streets themselves, with their motley crowds of whites and blacks and reds, of Spaniards, Negroes and Indians, of every shade of intermixture, tell their tale of the past, and make one despair of the future. Certainly, Lima is a scene where the effects of race, climate, corrupt government, ecclesiastical despotism and

irreligion, in their bearing on the development of free institutions, may be better studied than perhaps anywhere upon the globe.

In 1870 and 1871, Peru was sharing in the world-wide prosperity and the intoxication it produced. She had wasted in a marvellously short space of time the millions her guano beds had produced, and she was straining her credit to run lines of railroads from half-a-dozen hamlets on the coasts to indefinite points in the interior, to bring to markets minerals not yet mined, and agricultural products from land still in a state of nature. At the time Henry Meigs had taken railroad contracts involving nearly $100,000,000 (one hundred millions of dollars) from a state virtually bankrupt. The railroads had, however, put boundless patronage into the hands of government, which it used to reward friends and to pacify enemies. An exhibition building was in course of erection, to which the world was expected to flock. The banks had doubled their business in a twelve-month. The shops vied with those of Paris. Never had so long a period elapsed without a revolution. But before the exhibition opened, President Pardo was assassinated. The railroad building soon ceased on most of the lines. Paper money became almost valueless, and coin so scarce that it was made a crime to export it. Although the system of reckless railroad building was dishonest and unwarrantable, there is no doubt that the real wealth of Peru lies beyond the Andes on the head waters of the Amazon, and that till the products of the interior can reach the world either by rail to the Pacific, or by water to the Atlantic, the guano, and nitre and silver she at present exports will not enable her to pay her debts and raise her to the position of a solvent power.

The most stupendous of her inland railroads is that which runs from Lima up the mountain gorge that discharges the River Rimac through the heart of the city. It is to reach the Cerro de Pasco silver mines and thence descend to the fertile lands to the east of the Andes—but our journey leads southward.

After two days' thorough enjoyment of Lima, which even the wretched hotel accommodation of this, the former metropolis of Spanish America, could not damp, I took another boat of the Pacific Steam Navigation line, and steamed out of Callao Harbor between the southern end of San Lorenzo and the mainland. We soon ran into a thick fog, and all night long our whistle piped as lustily as though we had been upon the banks of Newfoundland.

It never actually rains on the Peruvian coast, but the fogs of the summer nights, which, as the season advances, merge into the thick mists of the winter mornings, supply sufficient moisture to nourish a growth of cacti and aloes upon the seaward face of the coast hills.

At breakfast on the following morning we stopped at one of those oases of the coast, Tombo de Mora, where a river, or rather rivulet, running down from the Andes, produces a strip of arable land, prolific in its productiveness. Boats came off with fruit, now with few bananas, but with splendid grapes and peaches, passion-flower and cactus fruit. The new fruits and the cool breezes told us of our rapid departure from the tropics.

After two hours' detention at Tombo, we heaved anchor and steamed along the barren coast to Pisco, the vineyard of Peru. Like Tombo, there is along the shore a patch of verdure which one can trace inland till lost among the hills. Here we were detained for nearly four hours, taking on board the brandy of the country—the common sort called after the place, Pisco; the best quality, Italia. M. Elias, the nabob of the place, makes, besides brandy, a sherry, which, after a sea voyage, is as good as the best from Spain, and sells here at $5 a gallon.

All the ports along this coast are open roadsteads. There is generally a mole; but, as at all times a most disagreeable ground swell rolls in, no vessel can lie at it; and swinging and rocking at anchor is most discomforting to one's feelings.

On leaving Pisco we rounded Cape Pisano and saw distinctly the three crosses which have been excavated on the extreme end of the promontory. The work is supposed to have been done by Pizarro, and is annually cleared out by the inhabitants near by, who make the holy pilgrimage an excuse for a grand frolic and pisco-drinking.

The bare and barren Chincha Islands lie a few miles to the northwest of the Cape, and almost to the West another large guano island, at which fifteen large ships lay, loading. All the guano but the scrapings was even then removed from the Chinchas. What was to last one thousand years had not lasted twenty, and the millions the guano brought (for it lay in places 150 feet deep, and netted to the Government $30 a ton) had been all wasted—spent on revolutions, in filling the pockets of those in office, and bribing those who were out.

The guano from the Lobos Islands, between which and the mainland we sailed after leaving Paita, as well as from other islands and from some of the headlands, is far inferior, and brings 33 per ct. less, so that the best is gone; but what remained was still so valuable that the Government was borrowing against it to build railways and make other public improvements. The fate of the Peruvian bondholders has since given sorry proof of the bad faith of the borrowers and the scanty value of the security.

The present scarcity of birds all along the coast is the more remarkable when we try to imagine the flocks which must have teemed upon every island and headland at the time these valuable stores of manure were being deposited. Our captain had never seen bird-life more abundant than at present; but an old coaster once told him the birds had forsaken the coast within the century, for that in his younger days they at times covered the water of some inlets so thickly that it was difficult to force a *balsa* through them.

The next day we spent one and a half hours rocking in front of twenty huts on a barren promontory, with not a blade of grass in sight, called Chala. There must be verdure behind the hills, for more peaches, oranges and lemons came on board, in return for which we sold the Chalans flour and rice and Florida water. Our deck was lined as soon as we left Callao with open tents, occupied by traders, who, on our arrival at each port, got their goods out and carried on a languid traffic with those who came on board. The only good shop-keeper among them was a Chinaman, who had a general stock of hardware and drygoods, gold watches, fruit, pisco, and I know not what beside.

At sunset we were passing under precipitous cliffs, and early on the following morning we anchored at Islay and Mollenda, two so-called ports on opposite sides of a rocky promontory—Islay the terminus of the donkey road to Arequipa, and Mollenda of the Arequipa railroad; but as Mollenda is even a more dangerous roadstead than Islay, the railroad will probably have to be cut through the rocky barrier. Of course, neither place is in itself anything, a few board and shingle houses, for here there are neither reeds, nor canes, nor mud to make adobe huts. Water has to be brought for miles over a desert, streaked most curiously with a pure white sand.

The railroad to Arequipa is a magnificent piece of engineering. We could see the road winding zig-zag up the steep sides of the coast hills to the pampas. Over these it pursues a level course for forty-five miles, and then ascends a mountain more than three thousand feet high to Arequipa, seven thousand feet above the sea. Since then it has been extended to Puna, on the shores of Lake Titicaca in Bolivia, and is diverting a great deal of the Bolivian trade from the Tacna and Arica Railroad.

From Ilo, the port we next anchored at, the first shovelful of sand, not soil, of a new line into the interior, was to be turned on the morrow—another visionary line intended to open up the wondrous but mythical mining wealth of the interior.

We got away from Ilo at 4:15 in the morning and continued our course under high bluffs, with the coast range not far off and the white peaks of the Cordillera gleaming in the sunshine above the clouds. At midday we anchored off Arica, but what a different-looking place to that described by travellers! There were the bold, perpendicular cliffs shutting in the valley to the south, and the coral reefs and islands forming the breakwater and an excellent harbor, and the valley tapering funnel-shaped to the east till closed in the distance by the hills trending north and south. The main features of the landscape were unchanged, but all else was gone. The splendid custom-house and public buildings, with their iron columns, which lined the sea; the mole; the railway station and construction shops; the thickly-packed houses; the churches and the gardens which filled the valley—all were first overturned by an earthquake on August 13th, 1868, and then swept away by a wave, which has left parts of the plain, once covered by iron and stone buildings, as level as a ploughed field. The devastation was awful, and the people had been so paralyzed that little had been done at the time of my visit to repair the damage.

It was the finest port along the coast, and as most of the products of Bolivia found their way through it by the Tacna Railway, it was provided with commodious public buildings, machine shops, excellent hotels, and inhabited by some 10,000 people.

About five o'clock in the afternoon of August 13th, 1868, an earthquake occurred, which, after two or three gentle vibrations, terminated in a shock which laid the town in ruins. As, however, there were very few two-storied buildings, and nearly all were adobe

and roofed with mud, not many lives were lost. Those buried were being exhumed when the sea was seen to recede and leave nearly a mile of bare coast. Soon a huge wave slowly gurgled up; the water was in a boil, and gradually rose till it reached its highest normal limit. The wave then invaded the land and flowed on into the interior, gathering force as it went and carrying desolation in its track. The water stood at the shore line thirty-six feet perpendicularly above its highest tidemark, when the wave retreated with terrific force. Twice it returned before the sea recovered its equilibrium. Five ships lay at anchor in the bay; one, when the water receded, struck on a ledge of rock and broke amidships. The cables of a United States storeship did not part, and when the sea flowed in she foundered with all on board. A French bark was carried high and dry into a garden, where her skeleton still lies. The Peruvian man-of-war *America* and an American gun-boat, the *Wateree*, both parted their anchors and were hurried towards land. The United States steamer fortunately went head on and was landed about half a mile from the shore, at the foot of a bluff, as safely as if placed in a dry dock, and with the loss of only one life; but the *America* struck beam on, her mainmast went, her guns parted from their fastenings, and eighty of the men who sought safety in the rigging were lost. She seems to have been carried back about 200 yards by the receding wave. I wandered through her wreck and tried to conceive the scene of horror. She lies two miles, at least, from where she was anchored, and about the same distance north of the town, on a spot where formerly there was a delicious garden. The American ship lies close under a bluff about fifty feet high; but the wave must have overtopped even it and reached far up on the plain above, for I found it strewn with sailor coats, soldier's belts and cartridge boxes, skeletons of fish, packets of ammunition and broken packing cases. The only leaf of printed matter I picked up was from one of Scott's "Chronicles of the Canongate."

That part of the town nearest the cliffs, which jut out on the south, being more elevated, did not feel the force of the waves as much as the more northerly quarters, where absolutely nothing was left. The railroad officials could hardly have told where the railroad building stood, had not a solitary palm tree remained standing. The three engines in the engine-house were hurled to

the distance of a quarter of a mile, and now show their steam-drums above water when the surf recedes. The coast is strewn with broken cars and twisted rails; heavy sleepers were carried out to sea and driven ashore again miles distant, and an old horse—a good-for-nothing one, of course—was washed away and landed safely on the other side of the cliff.

Where the splendid public buildings once stood, there are strewn a few broken columns, covered with dry sea-weed. I walked for a mile over the site of the old city, and it was as level as the desert beyond. Two or three houses withstood the force of the wave; one was protected by the goods from the custom-house packing against it as the wave mounted, and forming so strong a barrier that they saved it from destruction as the wave receded. Mr. Worm, the traffic agent of the railroad, told me he had his leg broken by the falling of his house, and a man, who had gone through the earthquake at Mendoza, had exhumed him and was carrying him off, when they observed the strange agitation of the sea. His bearer dropped him and ran; but two of his own men came to his assistance and carried him to the cliff, whither all had time to flee, so slowly did the water rise. There would have been fewer lives lost had the people not taken to the boats for safety on the occurrence of the earthquake, and been still on the water when it receded half an hour afterwards. All night long slight shocks occurred to terrify the maimed and frightened crowds gathered on the cliff. For three days Mr. Worm lay there without a blanket to cover him or any one to set his broken limb, till the medical officer of the United States gun-boat came to his relief. But the troubles of the doomed town were not yet over. In December, when rich and poor were still sheltering themselves in tents and huts, yellow fever broke out, and all agree that the earthquake was a lighter evil than the plague. Those who could afford it paid $10 a day for a native servant; those who could not helped themselves as best they could. I remarked to the head engineer, who was locking up a cupboard in the open air machine shop, that he had airy quarters. "Oh, yes; we have not yet recovered from the earthquake and the yellow fever; for a year no one had the heart to do anything." And he hoped it would not occur again—such catastrophes happened only twice in a century, at most—and he went off happily to his tea.

The officer commanding the *America* reported to his Government

as follows: "At 5.15 was felt a violent earthquake, and all the houses in the town were seen to fall. A boat was immediately lowered and manned by four men, who were to take on shore the appliances necessary to assist in extinguishing the fires which were seen to be spreading. The captain's boat was also ordered out; but before the men had embarked came a current from the south, so strong that both boats were swamped by it. The starboard anchor was dropped and sixty fathoms of cable run out, and one hundred fathoms on the larboard side, and by these anchors we were held. The first current lasted five minutes, flowed at the rate of 5½ miles and inundated the town. Then followed a second current, flowing in an opposite direction, that is, from the north, which left the bay almost dry, stranding at their anchorage two ships and all the small craft.

"The currents from south to north succeeded each other with such frequency and the alternations were so rapid that it was impossible to lower boats and assist the people crying for help, and whom we saw swept over the breakwater.

"At 6.45 the currents increased to 9½ knots, and their duration was from five to ten minutes. At 7.05 came a current from the south, with a velocity of 10½ miles, which obliged us to ship our anchor chains. Instantly we were ashore. Four minutes after, we were carried back to leeward, and one of the many waves which washed over us swept from the bridge our commander and Ensign Herrera.

"The ship was now stranded and its poop full of water, when the sea suddenly seized her and carried her nearly two miles, leaving her high and dry. Immediately we all lowered ourselves on to the beach and made all haste to escape, as other waves were rolling in behind us.

"The *Edward* is stranded in the gardens at about a mile from the town. The wreck of the *Chanarcillo*, and the hulls of the *America* and *Wateree* lie at about one and a half miles from the town, to the north.

"The *Morro* was violently shaken. Until the afternoon of August 16th shocks were felt and rumblings were heard, some say continuously. The violent shocks followed each other at intervals of 15 to 20 minutes at one time, and of 50 to 60 minutes at another."

The above narrative makes the first movement of the water to be

landwards, and this agrees with the order of the oscillations as observed elsewhere and on former occasions. But the first landward wave must have been so insignificant as not to have attracted the attention of the panic-stricken people, for all who described to me the scene spoke of the recession of the waves as what they first observed, and all agreed that the time occupied by the sea in retiring and then majestically rolling in gave ample opportunity to escape.

The earthquake that thus laid Arica in ruins is memorable for the wide extent of the earth's surface which experienced the commotion even more than for the violence of the shocks at the focus of intensity. This focus was not far from the latitude of Arica, but more likely beneath the Pacific than on the continent. Both north and south of Arica and Arequipa the catastrophe, the further it was felt, became less and less appalling in its consequences; while the time at which the first shock was then experienced was earlier than that at which the earliest vibrations were felt in latitudes either higher or lower. This frightful wave of the earth's seemingly solid but really elastic crust, originated at Arica at 4h. 38m., Lima time. Arequipa lies 140 miles to the north and 90 miles to the east. But four minutes later its inhabitants received the first warning of the impending disaster, which there was almost as terrible as in Arica; and but four minutes more elapsed before Lima and Callao, 300 miles further north, were slightly shaken by the now nearly spent wave. And it propagated itself with almost equal velocity southward, reaching Copiopo, in Chili, 610 miles south of Arica, at 4.52, or 14 minutes after it started from Arica. It was not felt as a shock of unusual violence north of Callao or south of Copiopo; but the marine phenomena were strongly marked over a much wider area than the terrestrial. At Callao violent currents threw the bay into such commotion at the moment the shock was felt on land that some ships dragged their anchors and came into collision, and the sensation experienced by those on board was as if the ship's keel had been struck by a large whale. At every port between Callao and Arica the sea rose and receded beyond its usual bounds, and south of Arica great damage was done; even as far south as Concepcion, in lat. 36° 43′, at nine in the evening, without any trembling of the earth, on a perfectly calm night and at low tide, the sea rolled up the river, tore ships from their anchorage

and stranded them on the bar. Still further south, on the Island of Chiloe, 1560 miles south of Arica, the sea was agitated about the same hour in the evening without apparent cause. Strange to say, the level of the sea for some distance north and south of Valparaiso, which lies midway between Coquimbo and Concepcion, at both which ports, though no shock was felt, the waves rose high, was not perceived to be at all disturbed.*

Calculating from the above data, the earth wave traveled northward at the rate of 55 miles per minute ; southward, at the rate of 44 miles per minute.

The sea wave seems to have struck the Sandwich Islands about twelve hours after it originated at Arica, and therefore, when traversing the broad sweep of the Pacific, the wave traveled at the rate of 525 miles an hour, or nearly one-half the speed of the earth's surface at the equator. But its rate of speed along the coast was much slower, for the marine commotion was not perceived at Ancud, on the Island of Chiloe, till about ten o'clock, or five hours after the earthquake at Arica. As Ancud is 1400 miles south of Arica, the wave can have traveled at the rate of only 280 miles an hour.

The anticipation of a half century's rest, with which the Aricans calmed their fears, was doomed to speedy dissipation, for at about 3.30 on the morning of May 9th, 1877, occurred another earthquake, followed by a wave of hardly lesser height than that of August, 1868. This levelled and swept away again the partially reconstructed town, and the wave even washed the *Wateree* from her high-and-dry position. All along the coast, north and south of Arica, more or less damage was done—at one place by the earthquake, at another by the wave—and the oceanic phenomena was as widely felt as on the previous occasion. It may be remembered that we were warned of the event by a messenger more rapid than steam, for on the 10th the telegraph announced the arrival from the south on the California coast of a great wave. This wave seemingly took one and a half hours longer to travel across the Pacific than did the preceding, as it was at 5 A. M. of the 10th—corresponding to about 10 A. M. of Peruvian time—that it was observed at Honolulu.

By a very careful and extended collection and mapping of observations as to the direction, deflection and rate of speed of these

* Domeyho, in Anales de la Universedad de Chile.—Jan., 1869.

huge waves, much information might be acquired, not only as to the probable conformation of the bottom of the Pacific basin, but as to the focus of those terrific commotions which so frequently shake the whole South American continent.

During my residence in South America I did not witness even one of those awful convulsions of the earth's surface, which, by the forces they exhibit in activity, revive before our eyes the scenery of past geological ages. But a week seldom passed, in a little valley where I spent some months, without our experiencing either a distinct shock, or, what is more startling still, a prolonged subterranean roar unaccompanied by any sensible motion. This peculiar sound was so loud betimes that I have even mistaken it for the blowing off of a large steam boiler not fifty yards from the house. Shocks were felt in our *quebrada* which did not affect the country round, and the direction whence the noises and undulations came was always the head of the valley. While the more violent earthquakes, therefore, are felt over extensive areas, many are confined to a very limited tract. Another proof of the superficiality of many, if not all, earthquakes, is that even in Chili they are rarely felt in mines. I met only one miner who remembered to have felt a shock underground, and the instances of damage done to mines are very few. Chilian mines are now generally worked on the European system, and a vast weight of stone and poor ore is therefore stowed away in the excavations on floors of timber, which would sink with their load did the walls of the vein, which give them support, heave as violently as the crust of the earth. Local circumstances, however, have a notable influence. For instance, in Canada, in October, 1870, an earthquake of sufficient violence to split thick stone walls occurred. At the Harvey Hill Copper Mine, in the Province of Quebec, where the strike of the Lower Silurian slates nearly corresponded with the direction of the waves, and where the workings were principally across the direction whence the undulation came, the shock was felt so severely at 40 fathoms deep that the miners rushed to the surface in terror; whereas, at the Capelton mine, 60 miles off, on a bed of iron pyrites, the miners were made aware of the earthquake only on returning to surface at the end of their shift.

For three days after leaving Arica we steamed beneath bold cliffs, towering from 1500 feet to twice that height above us, and sinking

generally precipitously into the sea, which only here and there has yielded up narrow strips of sandy beach to man. These have been taken possession of to build thereon the desolate towns which look like the very outposts of the habitable earth. First we passed Pisagua, not nestling, but crouching beneath a precipice; and Mejillones, in Peru, another group of wooden huts, occupying a like position; and Iquiqui, with room to expand inland beyond its present site for about a mile—all three outlets for the nitre which is obtained on the pampa behind the overhanging hills. A trade so vast has sprung up in that mineral that Iquiqui alone shipped in 1873, 6,263,767 cwt. But through the unwise interference of the government, which has made the mining of nitre a government monopoly, the total production of Peru fell in 1877 to 4,706,681 cwt. As the nitre beds extend across the narrow Bolivian coast into Chilian territory, and Chili declines to adopt Peru's commercial policy, war has been the result.

Steaming on beneath this rocky barrier, seldom broken now by even the ravines of dry river-beds, we crossed the boundary line of Bolivia and Peru, but all along the Bolivian coast the same desolation reigns. Nevertheless, men have there built themselves towns and are tempted to live in them, for copper and guano, as well as nitre, exist to excite their cupidity. Bolivia, with its glorious, prolific interior, enjoying a temperate climate, but so uniform that it raises the most delicate of tropical productions, is represented on the sea by the group of stone and wooden huts and houses comprising the town of Cobija, most forlorn in its pretensions as the seaport of what claims to be a great power. It had been, shortly before this time, the scene of a revolutionary battle, fought on the most harmless principles of revolutionary tactics. In the confusion no one had been officially appointed to the post of Captain of the Port, so its duties were assumed by a gaunt, sinister-visaged colonel, one of the successful heroes, who boarded us, but behaved with due civility and let us depart again in peace.

The nitre of this dreary coast is now the cause of contention between Chili and Bolivia, and Cobija and adjacent ports have been occupied by Chilian troops.

On we steamed past the confines of Bolivia and the neutral ground between Bolivia and Chili, which lies from 23° to 25° South. The establishment of this zone, the revenue from the

minerals of which was to be divided between the contracting powers, was agreed to by the treaty of 1866, when a war was brewing on account of the disputed boundary—a war which unfortunately the moderate counsels then dominant availed only to postpone.

But Chili gives the visitor from the North as gloomy a reception as Bolivia, for the Atacama desert faces him, and bids him abide on the sea, unless he would scale its high, rocky breastworks only to meet desolation and death, if he persist in penetrating its recesses. But ten years ago some of the secrets of that desert waste were unearthed, and forty leagues inland, over a trackless waste of sand and rock, were discovered silver lodes of fabulous richness. A waste the desert will remain; but Antofogasta, in Bolivia, has become the Pacific terminus of a railroad line, and the other terminus is to be 10,000 feet above the sea, on the cold, arid plateau to which the great chain of the Andes has here sunk, at the populous silver *mineral* of Caracoles.

For 300 miles more we skirted the almost unbroken barrier of rock; but, though the scene was barren as before, we saw more frequent traces of human industry. At El Cobre, Paposa, Taltal, and other ports, we passed copper smelting establishments or copper mines. At Pan de Azucar we saw the furnaces where copper ores from mines forty leagues in the interior are brought by ox-carts to be smelted. The name Pan de Azucar is common on the coast as applicable to the sugar-loaf hills which, whether as high cones or small peaked rocks, reminding me of huge stalagmites, form a striking element in the landscape.

At Chañaral we lay for some hours, discharging cargo for the inhabitants of that unsubstantial town of wooden shells, dirty from the smoke of the smelting furnaces and the large water distillery, and for the population at the mines of La Salada and Las Animas. These lie ten leagues up the gorge which here cuts through the rocky plateau, and which contains the bed of the Rio Salada, a river-bed not wetted often in a century.

At length we reach Caldera, the first place we had seen possessing any title to be called a town since leaving Callao. A street of well-built, two-story, stone houses, supported by a stone church, stone custom-house and railroad station, lines the shore; and a pier runs out into deep water and allows one the luxury, in fine weather, of walking ashore as soon as liberated by the

Captain of the Port. It is the port of Copiopo, and the railroad outlet of the silver regions of Chañarcillo, Las Puntas and Lomas Bayas.

A few hours brought us to the last of the altogether desolate ports of Chile, Carrizal Bajo, the seaport of the Carrizal and Cerro Blanco mines; and a few more to Huasco, at the mouth of the river of that name. We saw no water flowing, for every drop had been withdrawn for artificial irrigation; but looking up between its naturally-terraced banks, we distinguished, not far inland, green fields and orchards—a grateful sight—and we had rich earnest of what the orchards can produce, in baskets full of luscious grapes and peaches, the first verdure and the first fresh fruit we had seen since leaving Arica. The next stopping place was Coquimbo At anchor here we were really at rest, for it has a harbor which shuts out the swell, and is not, like all the other falsely called ports, an open roadstead. A sail of twelve hours, in sight of a rocky shore, surmounted by undulating hills, and with here and there a glimpse of a peak of the far-off Andes, brought us into the noble Bay of Valparaiso.

I fain would describe to you, but time does not permit, the romantic scenery of Chile and the hospitable habits of its people; the curious blending of autocratic and republican principles and practices in its constitution and government; the rapid but substantial growth of its mineral and agricultural resources, and the healthy state of its literature—a better proof of which could not be given than that a daily newspaper published in 1870 a translation of the annual address of your illustrious President.

APPENDIX.

Extracts from the Report of Mr. St. John, *H. M. Secretary of Legation at Lima.*

The Cerro de Pasco Silver Mines produced in—

1874	1,395,936 ounces.
1875	1,351,432 "
1876	1,358,792 "
1877	1,427,592 "

Estimated annual imports into Bolivia through the Peruvian port of Arica from—

Great Britain	£450,000	$2,250,000
France	260,000	1,300,000
Germany	230,000	1,150,000
Chili	34,000	170,000
United States	10,000	50,000
Italy	8,000	40,000
Spain and Portugal	8,000	40,000
	£1,000,000	$5,000,000

II.

Peruvian Guano.

In the Islands of Lobos a certain amount of guano remains, estimated lately at 600,000 tons, but the quality appears to be inferior and all shipments have for the present ceased.

The whole amount of guano in the southern deposits which remains to be exported amounts to an estimated quantity of 1,800,000 tons, thus distributed:

Huanillas	1,000,000 tons.
Point Lobos	200,000 "
Pabellon de Pica	350,000 "
Chipaua Bay	250,000 "
	1,800,000 tons.

The earthquake and waves on the 9th May, 1877, completely destroyed the Government Guano Works at Chanavaya, and caused the death of 400 people. Half a million dollars of property was destroyed on land, and $1,100,000 of shipping.

At Point Lobos the loss was estimated at $100,000 on land, and $400,000 on the sea.

At Huanillas a few lives were lost, $200,000 of property was destroyed on land, and $500,000 worth of shipping.

In 1877 there was sold of guano to—

England and her colonies	100,954 tons.
France and her colonies	72,067 "
Belgium	71,473 "
Spain	32,995 "
Germany	23,455 "
Italy	5,440 "
Holland	3,658 "
	310,042 tons.

III.

Peruvian Nitre (Nitrate of Soda)

Is mined from superficial horizontal beds of great extent in the province of Tarapaca, and is exported from a number of ports between Arica and Iquiqui. Nitre has also for many years been extracted by Chilians from the neighborhood of Antofogasta in Bolivia; and lately Pissis has found it in quantity as far south as Taltal in Chili.

In 1875 the exports from Peru reached 326,869 tons. In that year Congress authorized the purchase of the nitre beds by Government, and the issue of a loan of $35,000,000, of which $20,000,000 was to pay for them. By raising the export duty from $1 to $2.50 per cwt. the unwilling proprietors were coerced into selling. The result has been that by reducing the exports to 213,940 tons in 1877, the Government forced up the price from $55 to $80. The export of nitre by the Chilian company from Antofogasta has of late years increased rapidly, till it has reached 750,000 tons, and threatens to interfere seriously with the Peruvian monopoly; hence the present war.

IV.

Peruvian Railroads.

The following table shows the number and length of the Government and

private railroad lines in Peru, and the contemplated cost of those which had been erected or were in course of erection in 1876, since which date little construction has been done:

Government Lines.	Miles Length.	Contract Price.
Mollenda to Arequipa..... 114	Finished.	$23,027,580
Arequipa to Puno 232		
Juliaca to Cuzco 230	66 miles finished.	22,916,665
Chimbote to Huaraz and Remay.. 172	52 "	22,000,000
Pacasmaya..... 93	A portion finished.	5,562,500
Ilo to Moquegua 63	Finished.	4,626,250
Callao and Lima to Oroga..... 145	86¾ miles opened.	19,861,285
Salaverry to Trujillo 85	Dist. opened uncertain.	3,116,665
Paita to Piura..... 63	" "	1,757,915
Ica to Pisco..... 48	Finished.	
Lima to Ancon and Chancay..... 43	"	
		$102,367,860

Private Companies.		
Arica to Tacna..... 39	Finished.	
Lima Railways 17½	"	
Eten 50	At work.	
Pimentel..... 45	"	
Tarapaca 75	Finished.	
Malabrigo to Ascape..... 25	No information.	
Pasco Mines..... 15	At work.	
Lima to Magdalena..... 5	Finished.	

THE WONDERFUL RUINS OF CAMBODIA.

By Frank Vincent, Jr., M.A., F.A.G.S., F.A.E.S., etc.

(Communicated.)

It is not a little singular that while so much time, labor and life have been spent in exploring the secluded and savage parts of central Asia and Africa, more attention has not been bestowed upon the semi-civilized and easily accessible countries of Farther India. No book in any language gives anything like a complete account of nature and man as found there to-day. Its ethnology, philology and archæology are scarcely better understood now than they were in the days of the old Greek geographer Ptolemy.

Probably few Americans are aware that since the exhumation of the buried cities of Assyria by Botta and Layard, nothing has occurred so startling, or which has thrown so much light on Eastern art, as the discovery, seventeen years ago, of the ruined cities of Cambodia by Mouhot and Bastian—cities containing palaces and temples as splendid and stupenduous as any in Egypt, Greece or Rome. Though historically these relics may not be of such importance to us as those of Nineveh and Babylon, yet, from an ethnological point of view, they scarcely admit of over-estimation. It may be said that few countries present a more striking picture of lapse from the highest pinnacle of greatness to the last degree of insignificance and barbarism than Cambodia; nor is there a nation at the present day which can show so few traditions of the past, or produce so few clues to her ancient history. For beyond the half-fabulous records of the Chinese historians and a few legends which, it is to be feared, are more the invention of a subtle yet barbaric priesthood than an authentic narrative handed down from generation to generation, we have no account relative to this once powerful but now degraded country.

An ardent love of adventure and an enthusiastic desire to explore unknown countries impelled me to travel amid these unique regions. My tastes had already received the stimulus of partial gratification by two years of sojourn in Asia and the adjacent islands, when on the

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occasion of a third visit to Singapore, in the month of December, 1871, I first heard detailed descriptions of the wonderful ruins in Cambodia. This determined me to extend my tour in that direction. Bangkok, in Siam, became the starting point, whence I proposed to journey entirely across the Indo-Chinese peninsula to Saigon, in Cochin-China. In these days of much travel and many books, it is hardly necessary to refer to well-known features of Singapore or Bangkok, which cities are connected by a semi-monthly line of steamers.

After seeing everything of interest in southern and western Siam, the proposed overland excursion to Cambodia claimed attention. I had invited an American missionary and our consul at Bangkok to accompany me. We thought a month only would be requisite to accomplish the entire journey to the ruined cities, whence my companions would return to Bangkok, while I would go on alone to Saigon. I spent much time in endeavoring to obtain a Cambodian interpreter, one speaking English or even Siamese, who was willing to accompany us, but met with no success. However, the missionary's servant was a Cambodian by birth, and though he had passed nearly all his life in Siam, still remembered sufficient of his native tongue to be of considerable service to us. We took an assortment of medicines, especially a liberal supply of quinine, five grains of which were to be dissolved in our coffee regularly every morning. The offensive and more especially the defensive weapons of the party comprehended two revolvers and three large bowie-knives. We also carried a few scientific instruments, writing and drawing materials, and maps of the country (which, by-the-bye, proved so incorrect as to be of scarcely any use to us); and knowing that a *penchant* for accepting presents is not exclusively an American peculiarity, I also packed in my water-proof bag a few gifts for the King of Cambodia, the Governor of Siamrap, and some other great men. Provisions were taken in tin cans. Money was carried in several small packages, though our letters were quite adequate to secure us every hospitality and attention. These letters were simply official orders written in the vernacular idiom, with the great seal of the Foreign Office attached, from the Siamese Minister of Foreign Affairs to the Governors of the provinces through which it would be necessary for us to pass.

To our passports chiefly we were indebted for the success of the expedition. In Farther India, and in fact most countries of the

East, the natives humbly reverence authority and its enjoinments, and will readily find ways and means of complying with a governmental order, when the demands, bribes or threats of an unknown, unrecommended private traveller would avail nothing. Upon the Governors of provinces remote from the metropolis and the ruling monarchs, we were dependent for our means of transportation—elephants, horses, buffaloes, carts, boats, servants and guides—and everywhere on our journey, when the passports were produced, we were received with distinguished courtesy and consideration.

But I am anticipating. Everything is ready, and we are at last off. There are three boats—two for the travelers and one for their servants and provisions. The great floating city of Bangkok, steeped in spectral moonlight and kaleidoscoped with ten thousand colored lanterns, presents an appearance at once weird and picturesque as we swing away from the consulate wharf, with our prows headed up the whirling Menam. The boatmen break into wild, rude songs, to which their dipping oars keep time ; the distant howl of the pariah dog proclaims its quest of midnight prey; strains re-echo from many a Chinese booth, and the softening atmosphere improves them into a sweetness not their own ; and so, standing upon deck with night above us and mystery around, we wave adieu to Bangkok, that Venice of the East, and float onward towards the very heart of Cambodia—and our desire.

After a not uninteresting journey of two or three weeks, we arrived at Siamrap, which we found to be a town of about a thousand inhabitants, pleasantly situated upon the banks of a small river, four miles from the ruins at Angkor. Our letter from the Foreign Office at Bangkok, being forwarded to the Governor, was received with distinguished ceremony on a golden salver, and amid a conspicuous display of white umbrellas. Being presently invited to an interview, we entered the palace enclosure through an immense wooden gateway, preceded by the interpreter and followed by all our servants. We marched fearlessly past the gaping mouth of a large iron cannon, for we knew no danger was to be apprehended, since its bore had been converted into a peaceful aviary—its throat of thunder into a throat of song. The Governor received us in a long and broad verandah and waved us graciously to some chairs, himself taking one opposite to us. Behind him, on the floor, were some red velvet cushions elegantly embroidered with gold thread, and facing these

were placed the most magnificent betel-boxes, cigar-cases and spittoons we had as yet seen; they were made of pure Siamese gold and studded with costly gems. There was also a set of beautiful tea-things. Along the walls of the verandah were arranged rows of guns and swords. At the right were royal umbrellas, long state-swords, a clock and some glass candlesticks. The walls were hung with grotesque Chinese paintings. Grouped about the Governor were a hundred or more prostrate officers and attendants. The rank of each might be divined by his dress, the material of which his betel-boxes were manufactured, and his proximity to his lord and master. After conversing for some time, the Governor ordered his band of fourteen instrumentalists to perform for our amusement. Cambodian music consists principally of noise—of the shrill and penetrating sounds produced by flageolets and other peculiarly formed reed instruments, and the banging, clanging and rattling of tom-toms, cymbals, musical wheels and bamboo sticks. All the musicians play their loudest, most interminable notes in full blast, at the same time, and for half an hour without intermission. The character of the music, however, is often sweet, sometimes wailing and rather dirge-like, although always played in quick time. The instruments themselves are capable of considerable melody if played with reference to tune and time, modulation and expression. While performing, the musicians sit upon the floor in rows close together; there does not appear to be any particular leader.

The total distance we had traveled from Bangkok was about 300 miles, and the time consumed was nearly three weeks. The Governor of Siamrap having provided us with elephants, we started for the ruins of Angkor. We took but little baggage with us, being rather impatient now that we were nearing the main object of the expedition, the *Ultima Thule* of our hopes. So passed we silently along until, in about an hour's time, emerging from the dense forest, we caught, as in a vision, a glimpse of that of which we had come in quest. A gigantic row of columned galleries cast its deep shadow to the edge of a sheet of water fringed with lotus plants, and far beyond three or four immense pagodas towered above glittering groves of cocoa and areca palms. The emotion awakened by these solemn and decaying monuments of a vanished race had indeed something of the bright unnaturalness of a dream. My heart was in my mouth as the Cambodian driver, turning towards the howdah,

exclaimed with proud lips and flashing eyes, *Nagkon Wat!* for we were then at the very portals of the famous "city of monasteries," and not far distant was Angkor the Great!

And now, having arrived safely at the old capital, let us take a brief glance at the geography and what little is known of the history of Cambodia. When Angkor was at its height in the fourteenth century, Cambodia probably occupied nearly all of the Indo-Chinese peninsula. Native records indicate that the history of Cambodia commences about A. D. 200. We read of its army of 70,000 war-elephants, 200,000 horsemen, 600,000 foot-soldiers, and incalculable treasures. Twenty kings are said to have paid tribute to it. At first the inhabitants lead a roving life. They say they gave civilization to Siam, and we know Siam was for some time tributary to Cambodia. The name first occurs in Chinese history in A. D. 618, when it was a tributary of China in connection with all southeastern Asia. During the Tang dynasty Cambodia was a very flourishing state. The capital had 20,000 houses, and many of the palaces were overlaid with gold and adorned with ivory. There were thirty cities, each with one thousand houses. It was the most civilized portion of the peninsula, and its riches became a proverb. About the year 1400 the Cambodians united with the Burmese to crush the Siamese, but the latter recovering themselves prepared to invade Cambodia, and after a terrible war succeeded in conquering the people—killing the king, destroying and mutilating the city of Angkor, and so devastating the country that it has never to this day recovered itself.

Even two hundred years ago Cambodia was thrice its present size. But now it is bounded on the north by Siam and the Laos States, on the west by Siam and the Gulf of Siam, on the south by French Cochin-China, and on the east by Annam and the Makong river. It is perhaps one hundred miles in diameter, and the bisection of the 105th parallel of east longitude with the 12th parallel of north latitude nearly indicates its centre. Its population of about 1,000,000 embraces besides Cambodians proper, Chinese, Malays, Annamites and Siamese. The mineral, vegetable and animal productions of Cambodia are varied and extensive. The chief articles of commerce are rice, tobacco, sugar, gamboge (a sweet-smelling resin), silk and cotton; much fine timber and several species of dye woods are also exported. The mountains contain

gold, lead, zinc, copper and iron. The animals are the elephant, tiger, leopard, bear, deer, buffalo and hog, and the rivers are stocked with fish, some of them of immense size.

We, whose good fortune it is to live in the nineteenth century, are accustomed to boast of the perfection and pre-eminence of our modern civilization, of the grandeur of our attainments in science, art, literature, and what not, as compared with those whom we call ancients; but still we are compelled to admit that in many respects they have far excelled some of our recent endeavors, and notably in the fine arts of architecture, sculpture and painting. In style and beauty of architecture, solidity of construction and magnificent and elaborate sculpture, the great Nagkon Wat temple of Buddha has no superior, nor any rival, standing at the present day. The first view of the ruins is almost overwhelming. Neither Thebes nor Memphis have anything so enigmatical to show. It is grander than anything left to us by Greece or Rome. At a first sight one is most impressed with the magnitude, minute detail, high finish and elegant proportions of this temple, and then to the bewildered beholder arise mysterious afterthoughts—who built it? when was it built? and where now are the descendants of those who built it? It is doubtful if these questions will ever be satisfactorily answered. There exist no credible traditions—all is absurd fable or extravagant legend.

We entered first upon an immense causeway, the stairs of which were flanked with six huge griffins, each carved from a single block of stone. This causeway, which leads directly to the main entrance of the temple, is 750 feet in length and 30 feet in width, and is paved with stones which measure four feet in length by two in breadth. On each side of it are artificial lakes, fed by springs, and each covering about five acres of ground. We passed through one of the side gates and crossed the square to a bamboo shed, situated at the very entrance of the temple. Embosomed in the midst of a perfect forest of cocoa, betel and toddy palms, and with no village in sight—excepting a dozen or more huts, the abode of priests having charge of it—the general appearance of this wonderful temple is beautiful and romantic, as well as impressive and grand. A just idea of it can hardly be conveyed in words; it must be seen to be properly appreciated. Still a detailed description will assist the imagination somewhat in forming a proper estimate of the grand

genius which planned and the skill and patience which executed such a masterpiece of architecture.

The outer wall of Nagkon Wat--which words signify a city or assemblage of temples or monasteries—about half a mile square, is built of sandstone, with gateways upon each side, which are handsomely carved with figures of gods and dragons, arabesques and intricate scrolls. Upon the western side is the main gateway, and passing through this and up a causeway, paved with great slabs of stone, for a distance of a thousand feet, you arrive at the central main entrance of the temple. The foundations of Nagkon Wat are as much as ten feet in height, and are very massively built of a species of volcanic rock. Including the roof, the entire edifice—which is raised on three terraces, the one about thirty feet above the other—is of stone, but without cement, and so closely fitting are the joints as even now to be scarcely discernible. The shape of the building is oblong, being about 800 feet in length and 600 feet in width, while the highest central pagoda rises some 250 or more feet above the ground, and four others, at the angles of the inner court, are no less than 150 feet each in height! The quarries where the stone, a fine-grained sandstone, was hewn, are about two days' travel, or thirty miles distant, and it is supposed the transportation of the immense boulders could only have been effected by means of a water communication—a canal or river, or when the country was submerged at the end of the rainy season. In the stone-pits may still be seen large blocks, partially separated from the parent rock, and bearing many marks of the quarriers' chisels.

Passing between low railings, we ascend a platform composed of slabs four feet in length, and enter the temple itself through a columned portico, the facade of which is beautifully carved in low relief with ancient mythological subjects and arabesques equalling those of Nineveh. From this doorway on both sides runs a corridor with a double row of columns cut, base and capital, from single blocks, with a double, oval, carved roof, and consecutive sculptures on the outer wall. This gallery of sculptures, which forms the exterior of the temple, consists of over half a mile of continuous pictures, cut in low relief, upon sandstone slabs, six feet in width. The sculptures display a high degree of art and mechanical skill. Their subjects are chiefly taken from Hindu mythology—from the Ramayana, the "Iliad of the East," the Sanskirt epic poem of India,

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with its 25,000 verses describing the exploits of the god Rama and the son of the King of Oudh—which the builders of the temple either brought with them or received from India, or which was known by translations throughout Cambodia. The contests of the King of Ceylon and Hanuman, the Monkey-God, are also graphically represented. There is no keystone used in the arch of this corridor, and its ceiling is uncarved. On the walls are sculptured the immense number of 100,000 separate figures! Entire scenes from the Ramayana are pictured; one I remember occupies 250 feet of the wall. Weeks might be spent in studying, identifying and classifying the varied subjects of this wondrous gallery. The pictures are very expressive and animated, the attitudes of the figures being natural and grouped with considerable skill. You may see warriors riding upon elephants and in chariots, foot-soldiers with shield and spear, boats, unshapely divinities, trees, monkeys, tigers, griffins, hippopotami, serpents, fishes, crocodiles, bullocks, tortoises, soldiers of immense physical development with helmets, and people with beards. The figures stand somewhat like those on the great Egyptian monuments, the side partly turned towards the front. In the case of the men, one foot and leg are always placed in advance of the other. I noticed besides five horsemen, armed with spear and sword, riding abreast, like those which may be seen upon the Assyrian tablets of the British Museum.

In the processions several of the kings are preceded by musicians playing upon shells and long bamboo flutes. Some of the kings carry a sort of battle-axe, some a weapon which much resembles a golf-club, and others are represented as using the bow and arrow. In one place is a grotesque divinity, who sits, elegantly dressed, upon a throne surmounted by umbrellas. This figure, of peculiar sanctity, evidently had been recently gilded, and before it, upon a small table, were a dozen or more joss-sticks, kept constantly burning by the faithful. But it is almost useless to particularize when the subjects and style of execution are so diverse. Each side of the long corridor seemed to display figures of distinct feature, dress and character. "The most interesting sculptures are in two compartments, called by the natives, respectively, the procession and the three stages (heaven, earth and hell). What gives a peculiar interest to this section is the fact that the artist has represented the different nationalities in all their distinctive characteristic features,

from the flat-nosed savage in the tasseled garb of the P'nom and the short-haired Lao, to the straight-nosed Rajaput, with sword and shield, and the bearded Moor, giving a catalogue of nationalities, like another column of Trajan, in the predominant physical conformation of each race. On the whole, there is such a prevalence of Hellenic cast in the features and profiles, as well as in the elegant attitude of the horsemen, that one might suppose that Xenocrates of old, after finishing his labors in Bombay, had made an excursion to the East." *

In some compartments are represented the delights of paradise, in others the punishments of the infernal regions. "A crowd of persons are entering paradise and are received in palankeens; they have with them banners, fans, parasols and boxes for holding betel, without which even paradise would not be perfect happiness to a Cambodian. The elect, seated on a magnificent dais, are surrounded by a great number of women with caskets and fans in their hands, while the men are holding flowers and have children on their knees. These appear to be all the joys of paradise. The punishments of the infernal regions, on the contrary, are varied and numerous; and while the elect, who are enjoying themselves in paradise, are all fat and plump, the poor condemned beings are so lean that their bones show through their skin, and the expression of their faces is pitiful and full of a most comic seriousness. Some are being pounded in mortars, while others hold them by the feet and hands; some are being sawn asunder; others are led along like buffaloes with ropes through their noses. In other places the executioners are cutting men to pieces with sabres; while a crowd of poor wretches are being transfixed by the tusks of elephants, or on the horns of the rhinoceros. Fabulous animals are busy devouring some; others are in irons, and have had their eyes put out. In the centre sits the judge with his ministers, sabre in hand; all the guilty are dragged before them by the hair or feet. In the distance is visible a furnace, and another crowd of people under punishment, being tortured in diverse ways—impaled, roasted on spits, tied to trees and pierced with arrows, suspended with heavy weights attached to their hands and feet, devoured by dogs or vultures, or crucified with nails through their bodies." †

* Bastian. † Mouhot.

There are figures sculptured in high relief and of nearly life size upon the lower parts of the walls about the entrance; all are females. Their dresses are not the same as those worn by the Cambodians of the present day. There are no men sculptured on any part of the temple. The carving seems to have been done after the blocks were placed in position. The interior of the quadrangle bounded by the long corridor just described, is filled with galleries or halls (formed with huge columns) which cross one another at right angles. In the Nagkon Wat as many as 1,532 solid columns have been counted, and among the entire ruins of Angkor there are reported to be the immense numbr of 6,000, almost all of them monoliths and artistically carved! On the inner side of the corridor there are blank windows, each of which contains seven beautifully turned little mullions. At the time of my visit the ceilings of the galleries were hung with tens of thousands of bats, while pigeons and other birds had made themselves comfortable nests in out-of-the-way corners.

We mount steep staircases, with steps not more than four inches in width, to the centre of the galleries, which here bisect one another. There are two detached buildings in this square, which, in all probability, were formerly used as image houses, and which now contain Buddhas of recent date. In one of the galleries I saw two or three hundred images, made of stone, wood, brass and clay, of all shapes, sizes and ages. Joss-sticks were burning before the largest of them, which were daubed with red paint and partially gilded. We pass on across another causeway, with small image-houses on either hand, and up a steep flight of steps, fully thirty feet in height, to other galleries crossing each other in the centre, above which rises the grand central pagoda, 250 feet in height. The four smaller ones, which I have already mentioned, are much dilapidated and do not now display their full height; the porticoes also bear evidence of the pressure of the heavy hand of time. Upon the four sides of the base of the highest spire are colossal images of Buddha. These figures are grandly placed, for when the doors of the enclosing rooms are opened, from their high position they overlook the surrounding country, and Cambodia is thus contemplated by her wondrous gods of stone. The priests of Nagkon Wat worship here at the present day. There is one more gallery, and then we come to the outer corridor and pass through a magnifi-

cent doorway to the rear of the temple and walk round to our camp, not knowing which to admire the more, the grand conception of the design or the mechanical skill of the performance.

Before I speak of the builders and age of the ruins of Angkor, reference should be made to the special religious worship to which Nagkon Wat was dedicated. It may be that the aboriginal inhabitants of the Indo-Chinese peninsula were snake-worshippers, then Brahmins, and afterwards Buddhists, as probably were the people of northern India before the arrival of the Aryans; but I must dissent from the view of Ferguson, the distinguished writer on architecture, that Nagkon Wat was dedicated to Naga, or serpent-worship—to Phaya Naght, the snake-god. There are representations of the snake-god in several of the compartments of the grand gallery, and the roof, cornices and balustrades are decorated with five, seven and nine-headed snakes, says Ferguson. True; but the last Buddha, Gaudama, was guarded in his youth, according to the Pali mythology, by a snake, which has ever since been honored and used in the ornamentation of Buddhist temples throughout Farther India. The word Naga is the name of a fabulous dragon in all languages of the East Indian archipelago. In the Jaina temples the seven-headed snakes are the most prominent adornments. We would hardly be warranted in saying Nagkon Wat was of Brahminical origin because the gate and many other parts of it are ornamented with Hindu deities and female figures, for these are found in the Buddhist temples of China, Tartary, Siam and Burmah. The Mohammedans have adopted and adapted much of the mythology of the Jews. In China, Buddhism is mixed up with Confucianism and Tauism, and in Cambodia with Brahminism and Jainism.

All the evidence which I can obtain best supports the belief that Nagkon Wat was a Buddhist shrine. The combination of the four-faced Buddha occurs once in the great temple, and frequently among the ruins of Angkor. The female figures upon the lower parts of the wall, with their oblique eyes, flat noses and thick lips, are evidently of Tartar origin, and from Thibet perhaps Buddhism came to Central Indo-China. The inscriptions are in a corrupt form of the Buddhist sacred language. As far as we know, without relying upon native records, the people who have inhabited the country of Cambodia since about A. D. 1000, at least 300 years before

the building of the temple, were Buddhists. I am inclined to think that the architecture of Nagkon Wat is symbolical of the Buddhist cosmology. The numbers 3, 7, 9, and multiples of 9, seem to be mystic and sacred numbers among the Buddhists. There are supposed to be seven circles of rock about Mount Meru, the centre of the Buddhist universe—as there are seven circles on the central tower and seven mullions in the windows of Nagkon Wat. The sacred mount is supported on three platforms—so are there three terraces to this temple. Mount Meru rises from the ocean, and it seems to have been intended that Nagkon Wat, surrounded by its lakes and moats, should rise from a sort of inland sea. The temple of Boro-Buddor, in Java, has seven terraces. Some of the Buddhist temples which I have seen in Peking, China, have three terraces and triple roofs. In Nagkon Wat there are three approaches, the gateways are three in number, and there are three ornaments on the brows of the female figures or angels. In China the priesthood are ordained upon a triple terrace of their monasteries. The first terrace is for Buddha, the second for the written law, and the third for the monastic community. And even supposing that the builders of Nagkon Wat came originally from Ceylon, where snake worship has always been in vogue (though the Singhalese have been Buddhists for at least 2,000 years), I do not see why they may not have brought with them a species of Buddhism, debased or modified with Naga symbolism, as easily as one corrupted by Brahminism.

And now let me approach the interesting subjects of the founders of Nagkon Wat, and the date of its erection. Learned men who have visited the ruins have attempted to form opinions from studies of its construction, and especially its ornamentation. One would at first almost despair of reaching a decision or passing judgment when he saw in the same temple carved images of Buddha, four and even thirty-two armed, and two and sixteen-headed divinities, the Indian Vishnu, gods with wings, Burmese heads, snake-gods, Tartar figures, representatives of the Ceylon mythology, etc., though, as already indicated, these facts in themselves would not prove insurmountable obstacles to a knowledge of the founders. The juxtaposition in one temple of the symbols of so many different religions will not seem so strange when we remember that one great faith of India, namely, Vishnuism, appears to be a curious amalgamation of serpent worship, Sivaism, Jainism and Sabianism.

Some archæologists have supposed Nagkon Wat to be 1,400 years old, to have been built by different kings, and to have been completed by one who was a Buddhist. The Cambodians still possess accounts of the introduction of Buddhism. "Samanokodom left Ceylon and went to Thibet, where he was very well received; from there he went among the savages, but not meeting with encouragement from them, he took refuge in Cambodia, where he was welcomed by the people."* The celebrated German orientalist, Bastian, thinks this temple was built for the reception of the learned patriarch, Buddhaghosa, who brought the holy books of the Trai-Pidok from Ceylon. And Bishop Pallegoix, a French Roman Catholic missionary, who resided many years in Siam, refers its erection to the reign of Phra Pathum Suriving, at the time the sacred books of the Buddhists were brought from Ceylon and Buddhism became the religion of the Cambodians. The natives themselves can throw no light upon this subject. I asked one of them how long the temple had been built. "None can tell—many hundred years ago," he replied. I asked if the Cambodians or some other race erected Nagkon Wat, and he answered frankly, "I do not know, but it must either have sprung up from the ground, or been built by giants, or perhaps by the angels." Another man said he did not believe it was built by angels, for he could see the effect of the tools of man upon it—certainly an amazing display of intellectual acumen for a native. But still the Cambodians of the present day, whose genius expresses itself only in the carving of their boats, have no idea that their ancestors constructed these temples. It seems improbable that a race so indolent, poor and ignorant as the present could ever have designed and made these splendid causeways and temples. Cambodians are fond of saying: "If man built the Nagkon Wat, it must have been built by a race of more power and skill than any to be found now."

But then, if it was some other, now extinct, race who made these works, how comes it that they, with their superior energy, were swept away by the Laos and Siamese, timid tribes who really have no fight in them at all? And if we should rather credit the ancient Cambodians with the authorship of this temple, then the disappearance of a once splendid civilization and the relapse of a people

*Bastian.

into a primitiveness bordering, in some quarters, on the lower animals, seem to prove that man is a retrogressive as well as progressive being, and that he may probably relapse into the simple forms of organic life from which he is supposed by some to have originally sprung. Then, also, we would naturally ask, Was civilization, in the complex meaning we give that word, in keeping among the ancient Cambodians with what such prodigies of architecture seem to indicate? The age of Phidias was that of Sophocles, Socrates and Plato; Michael Angelo and Raphael succeeded Dante. There are luminous epochs during which the human mind, developing itself in every direction, triumphs in all, and creates masterpieces which spring from the same inspiration. Have the nations of India ever known such periods of special glory? It appears little probable, and it is only necessary to read the Chinese traveler of the thirteenth century, whose narrative a French orientalist* has translated, to be convinced that it was never reached by the ancient Cambodians. He describes the monuments of the capital, most of which were covered with gilding, and he adds that, with the exception of the temples and the palace, all the houses were only thatched. Their size was regulated by the rank of the possessor, but the richest did not venture to build one like that of any of the great officers of state. Despotism induced corruption of manners, and some customs mentioned show actual barbarism.†

M. Mouhot, a French naturalist who gave the first exact account of these since celebrated ruins, was strongly of the opinion that they were built by some of the lost tribes of Israel. The idea is worthy of consideration, for there are several thousands of Christians in Burmah whose doctrines agree perfectly with those of the Jews, who, it is well known, have penetrated into the remotest parts of Asia. M. Mouhot, in his travels through Indo-China, made many efforts to discover traces of Jewish emigration to Siam or Cambodia, but met with nothing satisfactory excepting a record of the Judgment of Solomon—attributed to one of their kings, who had become a god after having been, according to their ideas of metempsychosis, an ape, an elephant, etc. This record was found preserved in one of the Cambodian sacred books. Everywhere M. Mouhot was told there were no Jews in the country. Still he could

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* Rémusat. † Louis de Carné.

not but be struck by the Hebrew character of the faces of many of the savage Stiens; and when looking at the figures in the bas-reliefs of Angkor he could not avoid remarking the strong resemblance of the faces there to those of these savages. Besides the similar regularity of features, they had the same long beards, straight waist cloths, and also the same weapons and musical instruments. On the other hand, it would seem probable that if the temple had been built by one of the lost tribes of Israel, the Gothic architecture of the thirteenth century rather than the orders of Pagan Rome would have been introduced. Probably the greater number of the figures in the bas-reliefs resemble the Cochin-Chinese more than any other neighboring race.

It is M. Mouhot's belief that, without exaggeration, the antiquity of some of the oldest parts of Angkor may be fixed at more than 2,000 years, and that the age of the more recent portions approximates this period. But where are now the race of people who had the genius to plan and the skill and patience to erect such magnificent structures? No trace of them exists among the Cambodians of the present day, or among the surrounding nations, unless, indeed, faith is to be placed in the statement concerning the Stiens and another race—the Bannans—who inhabit the old country of Tsiampa. If the savage Stiens were the builders of Nagkon Wat, historical proof of the fact might be excused in view of their total ignorance of the art of writing. Their spoken language contains many words like the Cambodian. Their traditions mention the deluge. A missionary in Cochin-China seems rather to confirm M. Mouhot's impressions, for he writes: "Whether we consider the commercial relations of the Jews with these countries, particularly when, in the height of their power, the combined fleets of Solomon and Hiram went to seek the treasures of Ophir (a generic name, used, perhaps, to designate the two Indies), or whether we come lower down, to the dispersion of the ten tribes, who, instead of returning from captivity, set out from the banks of the Euphrates and reached the shores of the ocean—whatever ground of explanation we resolve upon, the shining of the light of revelation in the far East is not the less contestable."* Another circumstance of some interest is that the foundation of the neighboring city of Ang-

* The Abbé Jaquenet.

kor is referrred by the native historians to a prince of Roma or Ruma, and that the name of Roma is familiar to nearly all the Cambodians, who place it at the western end of the world. The presence of Roman Doric pillars at Nagkon Wat might perhaps be mentioned in this connection.

The general appearance of the buildings—the deeply worn stairs, the battered and decayed columns and slabs, the moss-covered and fallen roof, the absence of the keystone in the arches—all betoken considerable age, giving evidence of another people and another civilization. The style of the architecture of the temple resembles both the temples of India and of Java, and this would perhaps seem to indicate a Hindu or Malay origin. There is little resemblance to the Egyptian monuments. Here all is light, airy, graceful; there all is massive, severe and grand. The architecture of Nagkon Wat, however, really follows no order recognized in the west. It is neither Egyptian, Assyrian, Greek or Saracenic, but rather, I should say, a combination of all. If we concur with the ethnologist Pickering in the belief that the Siamese were of Malay origin, then the question might arise, Did the same race who built the temple of Boro-Buddor in Java, also build that of Nagkon Wat in Cambodia? They have, I know, a few resemblances. Boro-Buddor is a bell-shaped structure about 100 feet in height and 600 feet in diameter. It is built in seven galleries or terraces, without cement, and has four staircases which lead to its summit. The whole is intricately and beautifully carved. There are between five and six hundred niches in its sides which contain an equal number of images of Buddha. The walls present a series of historical or mythological episodes carved with minute detail in bas-reliefs like those at Nagkon Wat. Boro-Buddor is known to have been either a Buddhist or Jaina temple. It contains no inscription from which its age may be determined, though the traditional chronology of the Javanese ascribes its date to A. D. 1344. But it is a matter of certainty that the Hindus were in Java during the 13th, 14th and 15th centuries, and they doubtless built Boro-Buddor. Nagkon Wat was built, as I shall soon endeavor to show, about 1325, or nineteen years earlier than Boro-Buddor. Are we then to believe the Hindus erected both of these Buddhist temples?

Perhaps the reader would ask me if there were no tablets eulogising its founders or commemorating its establishment; no inscription

concerning the building and the builders set up in Nagkon Wat. To which I should reply, Yes; inscriptions truly there are; some can be deciphered and others cannot. But those which have been read only give descriptions of offerings made by different donors, with some allusions to religious ceremonies and mythological objects. There is a tablet of black marble about five feet square, let into the wall of the eastern corridor, from which this information, and this alone, may be gained. The inscriptions (which cannot be read by the present race) are written in ancient Cambodian, in characters that resemble the present alphabet, but have entirely dissimilar uses. The language differs from the vernacular Cambodian, as well as from the Pali, and is not understood now. It is said that several of the old kings introduced compulsory changes into the alphabet, besides changing the Cambodian era, and hence we see the almost hopeless confusion with which Orientalists have to contend in order to learn the chronology and history of this country. As further illustrative of these facts, the Pali —sister of the Sanskrit—is the sacred language of all the nations of Indo-China and Ceylon, though the mode of writing it in Ceylon is so unlike that practiced in Siam that the manuscripts of the one are not easily read by the priests of the other. What has been discovered of the Cambodian religious inscriptions would seem to indicate that they were derived or moulded from the Pali or Sanskrit, rather than the Malay or Chinese languages; and from this we might perhaps infer that the Cambodian religion and literature were from the west, and not the east. The French Government has lately dispatched an officer to bring home rubbings of all the inscriptions, and to search for records in the monasteries of the country. When that task has been accomplished we may perhaps hope that what after all must be a very easy problem, compared with the successes achieved by cuneiform scholars, will not have long to wait for a full elucidation. Yet even these records, when found and translated, may offer nothing of historical moment—since it is problematical whether the annals of Angkor or Cambodia have ever been written.

The Chinese Emperor Ching-Tsung sent an ambassador to Cambodia in A. D. 1295, who wrote an account of his visit. He mentions the wonderful appearance of the capital and its monuments, describes some of the manners of the people, among whom he noticed white women, but does not state whence they came. He says the

king was covered with gold, pearls and diamonds. Buddhism doubtless then prevailed in Cambodia, as he speaks of four-faced images of Buddah! From this writer's time until the latter part of the sixteenth century nothing authentic is heard. Christoval de Jaque, a Portuguese, who in 1570, being driven from Japan, took refuge in Cambodia, describes the ruins of this temple, and states that even the inscriptions were unintelligible to the Cambodians, and that Angkor was no longer a royal residence, but had been deserted by its inhabitants. Christoval says the Cambodians were the most potent people between the provinces of Burmah and Annam. Perhaps the name "Roma," so familiar to all Cambodians, was introduced by the Portuguese through the tenets of the Roman Catholic faith. But then why should their religion have become extinct, and still the tradition of a Prince of Roma remain? In 1600 the Portuguese historian, Ribodeneyra, refers to Nagkon Wat as an ancient ruin. Then, again, there is a long silence concerning these remains which is not broken until the year 1860. Since this date the labors and studies of M. Mouhot and Dr. Bastian, and Messrs. Kennedy and Thomson, have brought the wonderful temples to the attention of the civilized world, and almost, as it were, discovered them for the first time.

And now, perhaps, I should state more definitely the results of my own study of the ruins in 1872. As to the race of people who built the city of Angkor and the home of their descendants, I do not profess to have absolute knowledge. Among the many theories none seem to me even worthy of presentation. But as to when the temple of Nagkon Wat was built, I think I have satisfactorily determined, at least to within a few years. The mythology of Cambodia would take us back to a time coeval with the oldest monuments of Egypt. The more learned of the Cambodians give credence to neither of the traditions of 3,800 years B. C. or of 525 years B. C. as being the date of the founding of Angkor, but believe that it was founded A. D. 950, and was deserted in 1380, when the country was devastated by the Siamese. The late First King of Siam, who, it is well known, had made considerable research into the past history of his country, said that the accounts of Farther India prior to A. D. 1250 were altogether unworthy of credit. Angkor, as I have said, was finally destroyed by the Siamese in 1380. Though the Chinese traveler of 1295 gives a full account of all he saw there,

he makes no mention of the great temple. Work upon Nagkon Wat was probably begun many years before 1380, because it seems to be the masterpiece of Cambodian art, and the empire was already in its decline in the middle of the 14th century. In an old Buddhist gateway, about one hundred miles northeast of Peking, in China, there are sculptures of the seven-headed snake, and also an inscription in Devanagiri characters similar to those of Nagkon Wat, which bears the date 1345. Now, since we know the Cambodians sent embassies to China, it may fairly be inferred that this Chinese arch was built by Cambodian workmen. Hence I would conclude that the temple was built somewhere between the dates just mentioned—say about 1325, *i.e.*, 551 years ago. It would hardly be consistent, with such meagre evidence as we have, to assign to Nagkon Wat a greater age than 600 years, though perhaps some of the ruins of Angkor city, and others in the surrounding provinces, may be a thousand or more years old. But this assignment of the origin of the temple to so recent a date, in this instance, singularly enough, renders the problem of the present whereabouts of its builders all the more difficult of solution!

The old city of Uxmal, in Yucatan, almost rivals Angkor in extent, though it falls far short of it in the elegance and elaborate detail of its buildings. The climates of Yucatan and Cambodia are similar in their subjection to tropical rains, heat, summer dryness, and the very destructive powers of the vegetations by which they are covered. Stephens thought no monuments of Yucatan, retaining their forms, could be older than 800 years; and that none of those which are sufficiently perfect to be delineated could be older than 600 years. In other words, the majority of them belong to the great building epoch of the world—the 14th century. It seems very probable, therefore, that the great temple of Uxmal—the Casa de las Monjas—is contemporaneous with that of Angkor, the Nagkon Wat.

Whether the last mentioned temple was built by some aborigines of the country, the ancestors of the present hill-tribes, or whether the ancient Cambodians came from the northwest, from Tartary, and were simply a branch of the Siamese or Burmese race, has yet to be determined. If we assume that the Cambodians built the city of Angkor, it is still difficult to fix their origin. Their physiognomy, character and religion would seem to bespeak a Thibetan or Tartar and Brahminic descent; their stone buildings resemble

those in India; their laws savor of China and Mencius; while their language is of Sanskrit and Chinese amalgamation. The Annamese, the neighbors of the Cambodians on the east, possess the manners, laws, written language, and customs of the Chinese, yet they are apparently a distinct race. When the Buddhists were driven out of India in the fourth century some of them took refuge in Thibet, others in Ceylon. Afterwards the former went to Cochin-China, while the latter crossed to Burmah and Cambodia. Those settling in Cambodia might have reared this vast temple, retaining, it is true, the myths of the old superstition, but commemorating their adoption of a better and purer faith. And if we agree that wars have driven the ancient Cambodians from their country, where are now their descendants? Perhaps in the adjoining provinces of Siam and Laos, where are to be found to-day districts whose population is nearly entirely composed of Cambodians who were originally led away captive from their native country to people the "desert places" of the peninsula.

The hieroglyphics of Egypt have had a Champollion, the cuneiform inscriptions of Assyria have had a Rawlinson, the Toltec picture-records of Central America have had a Squier—now who will decipher for us the mysterious tablets of Angkor? Probably the feat will be achieved before long, though the difficulties are very great. Thus it has been found there are three styles of writing adopted, with characters fundamentally the same, which are modifications of the Devanagiri alphabet, or the ordinary form in which the Sanskrit is written; and that the Cambodians abbreviated the long Pali terms to suit their own monosyllabic speech, as do the Burmese to-day with their language, itself a variety of the ancient Pali. This they did on their monuments either by engraving the unpronounced part of a word, or by carving the words as pronounced but not as written.

The principal ruins of Siam and Cambodia yet discovered lie upon a plain about fifty miles in width in the province of Siamrap. The greater number of them are temples. Their design and execution show varying grades of art, which indicate varying periods of erection. The temple of Nagkon Wat, however, displays the most taste, and is the most beautiful and perfect of any of the remains. At about three miles from Angkor are the ruins of a city called Patentaphrohm, and near it is a temple about 400

feet square, presenting the same combination of a royal and priestly residence as do Angkor and Nagkon Wat. Some of these temples and palaces, with their columns, sculptures and statues, are nearly as interesting as those at Angkor. About four miles from *the* great temple are two other ancient remains—Bakong and Lailan. The former is a lofty pyramid, reared in the style of the Mexican teocalli. At the latter there are several images of Buddha built of bricks which are exceedingly hard, and made in a manner not understood now by the people of the country. They are polished and laid upon each other in so neat a manner that no traces of mortar can be discovered. In the province of Battambong, forty or fifty miles southwest of Siamrap town, there are also ruins of temples, monasteries and palaces; and, indeed, the whole valley of the Makong river to the very borders of China, is spread with ruins of more or less magnitude, beauty and interest.

Near the monastery of Prakeoh is an artificial lake built by the kings of Patentaphrohm, and surrounded with pleasure-houses for their recreation. It must have been a work of immense labor, for the whole population of the Cambodia of to-day would scarcely be able to raise such a gigantic structure. The lake is of oblong shape, about 2,000 feet broad and 4,000 feet long, and surrounded by a high embankment of solid masonry. Some of the blocks are as much as sixteen feet long and highly finished. In convenient places square platforms are built overhanging the water, with broad flights of steps leading down to it, and in such places the huge masses of stone laid on each other are embellished upon their ends by delicate chiselling, bearing the figures of serpents, eagles and lions. In the middle of the lake is a small island with the remains of a former palace upon it.

The outer wall of Angkor city is now the only one at all preserved. It is about twenty feet in height and ten in width, built of large square blocks of coarse ferruginous stone, and has two gates upon the eastern side and one upon each of the others. A moat two hundred feet wide surrounds the city. The ancient city was two and a half miles in length and two and a quarter miles in width, surrounded by three walls, the outermost of which, the natives say, it would require an entire day to circumambulate. We entered by the south gateway—a pyramidal structure, perhaps fifty feet in height, rising above a pointed arch. On the top of

this gateway was growing a *poh* tree, with a trunk as much as three feet in diameter, which sent its roots down through and over the huge blocks of stone into the rich earth. The area within the walls is now mostly overgrown with jungle. Excavations reveal nothing but rubbish of brick and pottery. About a mile north from the gate is a colossal statue of Buddha, formed of large stones, and evidently of modern fabrication.

A little farther on, in the midst of the forest, are the ruins of an immense temple—some 400 feet square—a one-story building, enclosed by high walls and surmounted by fifty stone pagodas disposed in parallel rows. These pagodas are about fifty feet in height, except the central one, which was originally at least a hundred, and upon their four sides colossal faces of Buddha, eight feet long by four feet in width, are sculptured. These four-faced Buddhas wear a pleasant, good-natured expression, which is heightened by the corners of the mouth curling upwards. The ears are long and narrow, and slit like those of the Burmese Gaudama, but a rather fancy tiara or head-dress takes the place of the short curls of most Buddhas. These enormous heads recall the sphinxes of Egypt. One of them is nearly concealed by a network of the roots of a tree which has grown up from the side of the pagoda. To the poh trees and the banyan and the fig are due in great part the present ruinous state of this temple. These destroyers do their fell work by insinuating their roots and branches into the walls. When we think of the climate, the ravages of war, the encroachment of the jungle, and the apathy of the present inhabitants, who do not repair them, we wonder at the present state of preservation of many of the ruins. Still, it is doubtful if these grand monuments can defy time much longer. Some of the blocks of stone in the pagodas are separated by as much as an inch, and many seem only to require a touch to topple them to the ground. I saw a solid block of stone, six feet in length, which was supported in a nearly horizontal position solely by the roots of an immense poh tree. Some chambers of this temple are entirely choked up, and over and through all the ruins the parasitical poh has spread its roots and reared aloft its glossy green head, while shrubs and coarse grass now riot where once the praises of the great Buddha—the Illuminator of the World—resounded through the halls. Thus eternal nature effaces evanescent art;

thus monument and hieroglyphic are concealed beneath the envious arabesque of leaf and flower !

About half a mile from here we came to the palace gate of the inner or third wall, upon one side of which, on an immense stone platform, rests the statue of the Leper King, he who is supposed to have founded or at least completed the building of Angkor. The sides of the platform are faced with slabs of stone, covered with different featured and costumed figures, all sitting in cross-legged positions. On the opposite side of the gateway are pictures in stone —a battle and a military procession. What remains of the palace is a structure of pyramidal form terminating in a tower, the whole probably 150 feet in height. It is much dilapidated. From the staircase the sandstone has fallen away, and the underlying coarse volcanic rock is much worn. In a small room near the summit were long inscriptions engraved upon the jambs of the doors, in the ancient undecipherable Cambodian characters.

The statue of the Leper King is carved from sandstone, in a sitting posture. The body, although naked and rather rudely cut, yet exhibits a marked contrast to the physical type of the present race of Cambodians. The features are of a much higher order; indeed the profile is quite Grecian in outline. The eyes are closed; a thin moustache, twisted up at the ends, covers the upper lip; the ears are long, and have the immense holes in their lobes peculiar to the Burmese and Siamese images of Buddah; the hair is thick, and displayed in curls upon the head, the top of which is surmounted by a small round crown. It is said that men having features like the statue of the leprous king may be occasionally met with at the present day in the mountains of Annam. There is an inscription in ancient Cambodian characters upon the front of the pedestal. The natives, with astonishing forethought, have placed a small grass thatch over this statue. They have also somewhat naturalized (if a foreigner) and very much travestied their royal ancestor (if indeed such he be) by blackening his teeth, rouging his lips and gilding his forehead.

Of course the precise history of the Leper King is not known. One tradition affirms that Angkor was founded in fulfillment of a vow by a king who was a leper. Another tradition says that to an *Egyptian* king, who for some sacrilegious deed was turned into a leper, must be ascribed the authorship of Angkor. And I should

not think this worthy of mention were it not that, owing to some fancied resemblances (resemblances are often of little real value in tracing the history of races) between the religion of Buddha and that of ancient Egypt, a late writer* seems to think these "point to the fact that at some very remote period the Egyptians, or a people identical with them, held sway over this portion of the globe." He speaks of the likeness of the *prachadis* or sacred spires of the Siamese and Cambodians to the pyramids, but there are no prachadis among the ruins of Angkor! The physiognomy of the Cambodian Buddhas, too, compares better, that is more correctly and fully, with that of several tribes now inhabiting the plateau of Tartary than with any race yet discovered in Ethiopia. The Siamese word *phra*, prefixed to the titles of their kings, means "lord" or "master"; it will hardly bear the rendering *Pharaoh*. And the fact that "the Egyptians were red-skinned, and the Siamese [and Cambodians] are a mixture of black, yellow and white, and there are no vestiges of a red race among them," seems to indicate that the length of time which has elapsed since the red men were here has been so great that none of the ruins, if the hypothesis of the Egyptians holding sway over a portion of Indo-China were tenable, could now be standing in such tolerable condition.

With our present very limited knowledge of Indo-Chinese archæology, this is all the light I am able to throw on these interesting ruins. A richer field for Oriental research nowhere exists than in Cambodia; and I hope the time may soon come when the inscriptions on the temples of Angkor will be studied with a zeal equal to that bestowed upon the Egyptian monuments and the Assyrian tablets.

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* *National Quarterly Review*, vol. xxvi., art. "Siam and the Siamese."

A PROPOSED METHOD OF APPROACHING NEW YORK HARBOR BY SOUNDING.

By LIEUTENANT TRUDELLE, of the French Navy, Commanding the Transatlantic Company's Steamer "France."

[Translated and arranged for the American Geographical Society by LIEUTENANT THEODORUS B. M. MASON, U. S Navy.]

Although generally conceded that summer is the foggy season on the American coast, it is during the winter months, from December to March, that the most fog is found on the Long Island and New Jersey shores. It is during these months that most of the cases of going ashore occur.

Without considering whether the current which *generally* exists between the American coast and the Gulf Stream is a counter current of the Gulf Stream or the continuation of the Labrador current, it will be sufficient to state that it sets to the southward and westward, and that it is not uncommon to find it from the Nantucket Banks to the mouth of the Delaware moving at a rate of two miles an hour; its temperature is much lower than that of the Gulf Stream. From the Nantucket Banks to New York it augments in force with and after on-shore winds. Because this current is *generally* to the southward and westward, it must not be supposed that it is always so. Sometimes there is no current. At others it has been found setting to the northward, and northward and eastward; this is, however, of rare occurrence; in this case it is very feeble.

A fresh-water current flows out of the Bay of Fundy at the season of the melting of the snow and ice (April and May). This currrent, flowing to the southwest and to the south southwest, joins, after crossing St. George's Bank, the one previously alluded to.

It would seem probable that the grounding of transatlantic steamers, which has occurred so frequently on the New Jersey coast from Squan Beach to Sandy Hook, might be attributed to this southwesterly current, and the peculiarities of soundings on the routes generally taken, which blind the navigator to the effects or

the current. Before going further, let us examine the facts which have come to our notice in a period of three years (1874–1877), groundings, wrecks, and observations.

1st. The *Alexandre Lavallée* (French steamer), lost on Long Island, near Shinnecock light. It would be interesting to know how the vessel came to this position, but no details are at hand.

2d. The *Queen* (English steamer) went ashore on Squan Beach in a fog ; fine weather, calm ; floated off with the aid of a N. W. squall twelve or fifteen hours afterwards ; reached New York without serious loss. What precautions were taken on approaching the land, in this case, are not known, but as the fog had existed for two days previous to the accident, it is not probable that she approached without sounding. At any rate, she overran her reckoning and was to the southward.

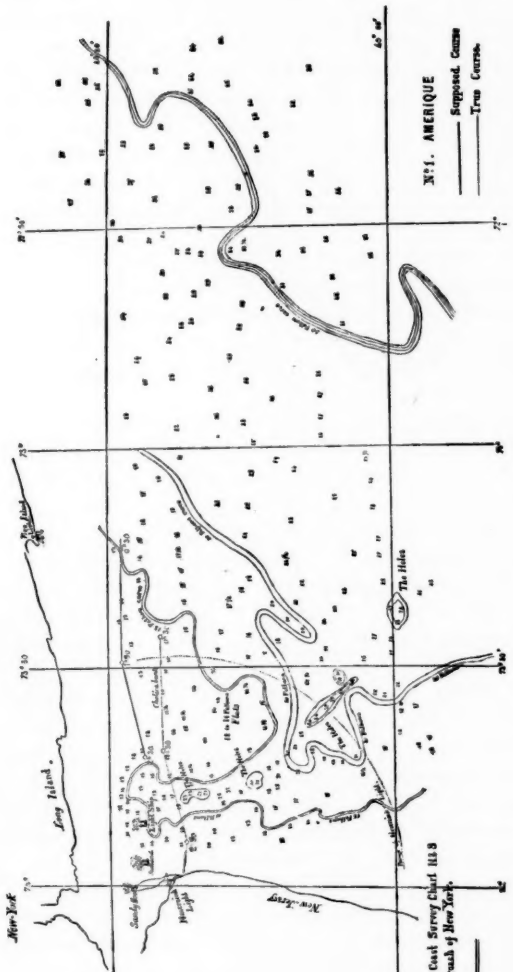
3d. The *Vicksburg* (American steamer). The *Vicksburg*, coming from the southward, was lost on Long Island the same day as the *Queen*, she having, in a clear-up, mistaken Fire Island light for Barnegat light ; last sounding, 12 fathoms ; bottom, fine sand.

4th. The *Circassian* (English steamer), lost on Long Island. No details at hand.

5th. The *Amerique* (French steamer). On the 7th of January, 1877, in thick weather and an easterly gale, the *Amerique* went ashore at Sea Bright. Good observations on the 6th, at meridian. The weather became thick about midnight ; soundings were taken at 12h. 30m., 1h. 30m. A. M. and 2h. 30m. A. M. At the instant of soundings, 2h. 50m. A. M., the reckoning placed the ship 10 miles to the E. N. E. of Sea Bright ; ahead of her reckoning and to the southward. (Plate No. 1.)

6th. *Russland* (Belgian steamer), some days after the *Amerique* in thick weather, went ashore some miles to the southward of the preceding. Less solidly built, but especially less fortunate, the *Russland* went on a hard bottom (an old wreck), which soon broke her in and sunk her. All that we know of the *Russland* case is, that the captain took early precautions, having in mind the recent going ashore of the *Amerique ;* he intended to bring to 20 miles from the shore. He was, therefore, more than 20 miles ahead of his reckoning, and to the southward.

7th. During the stay of the *Amerique* on the sands (from January 7th to April 10th, 1877), two steamers owed their salvation to


N°1. AMERIQUE
Supposed Course
True Course.
New York
Long Island
New Jersey
Sandy Hook
Navesink Light
Staten Island
The Hides
Robbins Reef
Bedloe's Island
Governor's Island
Ellis Island
Pavonia Ferry
Jersey City
Hoboken
Weehawken
Fort Lee
Fort Washington
Harlem River
Spuyten Duyvil Creek
Hudson River
Kill van Kull
Newark Bay
Arthur Kill
Raritan Bay
Sandy Hook Bay
Gravesend Bay
Lower New York Bay
Upper New York Bay
Hudson River
East River
Newtown Creek
Gowanus Bay
Buttermilk Channel
Red Hook
Gowanus Canal
Wallabout Bay
Navy Yard
Brooklyn
Williamsburg
Greenpoint
Long Island City
Astoria
Hell Gate
Blackwell's Island
Ward's Island
Randall's Island
Port Morris
Mott Haven
Morrisania
Fordham
Kingsbridge
Yonkers
Spuyten Duyvil
Manhattanville
Bloomingdale
Harlem
Manhattan Island
Fort Hamilton
Fort Lafayette
Fort Tompkins
Fort Richmond
Fort Wadsworth
Fort Diamond
Fort Gibbon
Fort Schuyler
Fort Totten
Fort Hamilton
Fort Lafayette
Fort Tompkins
Fort Richmond
Fort Wadsworth
Fort Diamond
Fort Gibbon
Fort Schuyler
Fort Totten
Sketch of U.S. Coast Survey Chart 1848
The approach of New York.

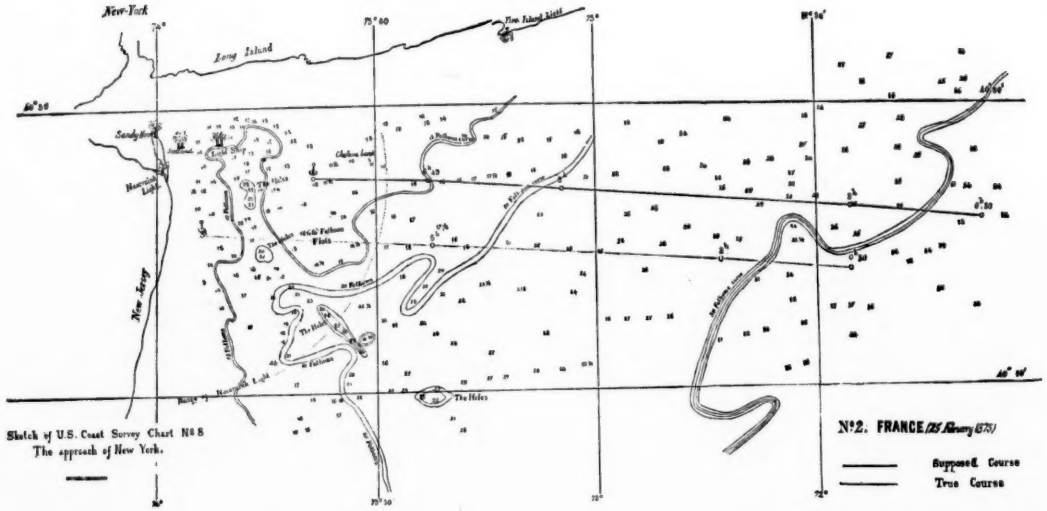
her presence at Sea Bright. This large object, which they noticed in time, caused them to go about some minutes, or perhaps even seconds, before the moment when they would have touched. These vessels were ahead of their reckoning, and to the southward.

8th. The *France* (French steamer), lost on the 25th February, 1875, in thick weather. She anchored in 12 fathoms of water, 14 miles to the W. S. W. of her estimated position, which placed her in the same depth of water 11 miles E. S. E. of the Sandy Hook lightship. Ahead of her reckoning, and to the southward. (Plate No. 2.)

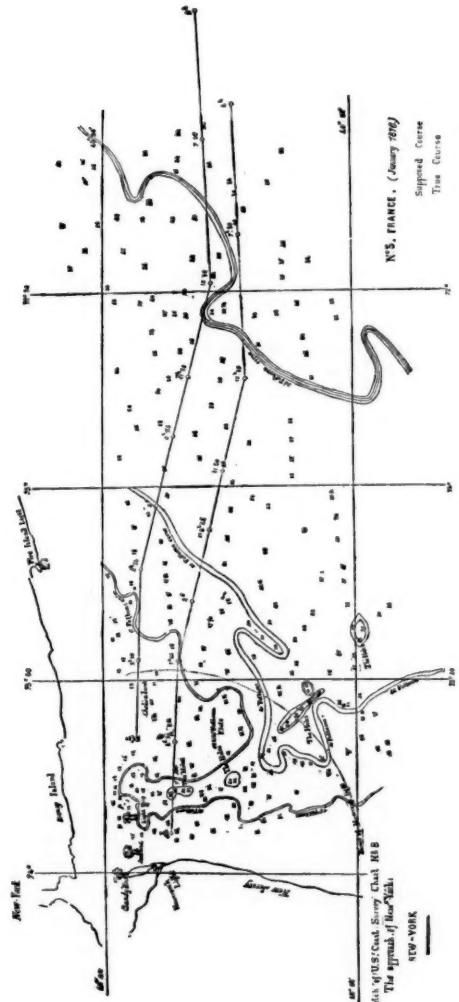
9th. The *France* (same ship). January 1st, 1876, running by soundings in thick weather, the *France* anchored in 12 fathoms, 12 miles to the W. S. W. of her estimated position, which should have placed her in the same depth of water 9½ miles to the eastward of the Sandy Hook lightship. Ahead of her reckoning, and to the southward. (Plate No 3.)

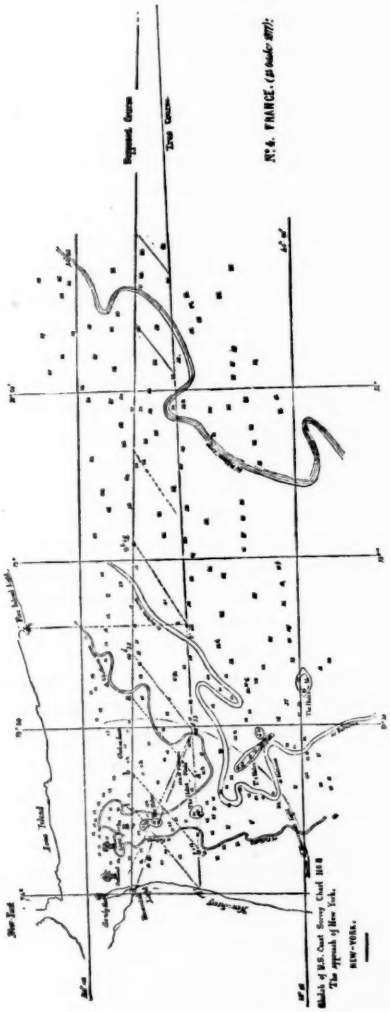
10th. The *France* (same ship). October 25th, 1877, at meridian, excellent observations placed the ship 154 miles from Sandy Hook. Fine weather; almost calm. Magnetic course N. 87° W. to Neversink light; passed 15 miles to southward of Fire Island tower. At 9h. 35m. P. M. Fire Island light, bearing magnetic north, showing an overrun of 8½ miles on the reckoning from noon. It also appeared further off than 15 miles, the distance at which it should have been passed. At 10.35, the Neversink lights appeared to starboard, bearing N. 65° W. (true), giving by their bearings at position 9 miles to the southward of the estimated one. The course N. 87° W., giving actually one S. 87° W., passing 11 miles to the southward of the Neversink. Nine miles to the southward and 8½ miles to the westward in 10h. 30m. is 12½ miles to the southward and westward, or 1m. 25 per hour. From 10h. 35m. P. M. to midnight, the vessel going 13 knots, it was necessary to head gradually 6° to the starboard to counteract the current and keep her heading on the Neversink lights. (Plate No. 4.)

These examples show sufficiently well the influence of the southwesterly current on the courses, and it remains to be seen how careful and prudent captains did not know, by means of sounding, their true positions. By comparing the accompanying charts, which refer to the *Amerique* and *France*, with U. S. Coast Survey Chart No. 8



Sketch of U.S. Coast Survey Chart Nº 8
The approach of New York.


N.Y. FRANCE. (January 1916)
Supposed Course
True Course
Long Island
New York
Sandy Hook
Entrance to New York
NEW-YORK


Raynard Course
Zone Course
No 6. FAIRGE. (Blade #77)
Sketch of U.S. Coast Survey Chart 1878
The approach of New York.
1878-1880.

(Gayhead to Henlopen), it is immediately apparent that, on the actual courses and the intended courses, the soundings are almost exactly the same. Nothing further is needed to explain all the mistakes, and demonstrate clearly that the route is dangerous, as the same successive arrangement of soundings may occupy many different positions on the chart.

Then, taking plate 4, referring to the *France* (observations of Oct. 25th, 1877), it is seen that it is easy to find, in the different positions, true and estimated depths exactly similar on the two courses, separated by the same distances, with the final difference of 10 miles to the southwestward in the positions at 10h. 35m. P. M.

Let us suppose a vessel arriving on this course, having had good observations at meridian, finds weather thick at 4 P. M., or 100 miles from Sandy Hook. Let it be admitted that soundings were commenced in about 25 fathoms of water; the soundings agreeing perfectly with those estimated on this course, would certainly have given the captain confidence in regard to the 10h. 35m. P. M. position. Continuing his course, without sounding, with the intention of bringing to, or anchoring, according to the weather, at A or B, the ship would simply go ashore at A.

It is most probable that this has already happened to more than one vessel, and it is, moreover, in this way that the *France* obtained erroneous positions on February 25th, 1875, and January 1st, 1876. The soundings, although very numerous, agreed so exactly with what it was estimated that they should have been, that the position seemed certain. But let us return to our supposition:

We have a vessel ashore after running by reckoning only 15 or 16 hours, and with excellent soundings. Let us blame the captain for not having continued his sounding after 10h. 35m. P. M., and let us notice that two soundings, taken unfortunately at a^1 and b^1, would only have increased his certainty of having good positions at a and b. A sounding at c^1 would perhaps have enlightened him, but it is more than probable that it would only have surprised him. Admitting that this sounding would have saved the vessel by stopping her, it would have been by chance; in navigation nothing must be left to chance that can be helped; chance has already too great a hold on the fate of vessels.

It can be assumed that running in on a westerly course offers no assurance of safety.

The lines of equal depths in the latitude of Sandy Hook, run almost parallel to the Long Island coast ; that is to say, W. S. W. and E. N. E. ; it is self-apparent that a westerly error accompanied by a southerly one would not be made evident by sounding, and that it is easy to trace, to the southward of each other, westerly courses on which the soundings will coincide with the course actually run, but with marked differences toward the west, that is, toward the dangerous Jersey shore, more marked still as these lines or courses are more and more to the southward.

It is about on the parallel of 40° 25′ that vessels generally run in arriving. Five or six miles' difference towards the south give from ten to twelve miles' difference westward for the same depth of water. Besides, the depths of 13 and 14 fathoms, and even of 10 and 12 fathoms (Cholera Banks), are met on this course at 25 or 30 miles from Sandy Hook, but they are also found at 2 or 3 miles from the coast. How can we clearly distinguish them one from the other? By the quality of the bottom? In most cases this is a poor means, and most uncertain. I have heard many seamen propose the following method: When, by reckoning, you are in the environs of Fire Island, steer to the N. W. until you get 15 fathoms by the lead ; then run W. S. W. toward Sandy Hook, and stop when *you think* that you are at the proper distance in 13 fathoms of water.

This routine method is as uncertain as the direct course, and condemns itself. At sea there is no such thing as "*you think*" when one can be absolutely certain. All the vessels that went ashore were *thought* to be in good positions.

The only conclusive way of assuming the safety of one's ship on this course is to stop when you reach 14 fathoms, but one is exposed to "hinging to" very far off, and, above all, one does not know where he is.

The quality of the bottom should not be neglected. Alone I consider it only useful in selecting good holding ground. The *Vicksburg*, for instance, having a sounding in 12 fathoms, *fine sand, no gravel*, should perhaps have thought that she was not off New Jersey, For the *Amerique*, on the contrary, the presence of pebbles in the arming of the lead at her 13-fathom sounding, 2 h. 30 m. A. M., indicated very clearly that she was off New Jersey, and that it was necessary to go about promptly. The unpardonable ignorance of the pilot, who affirmed that these pebbles were not found on the

Cholera Banks, was certainly one of the principal causes of the going *ashore.*

I have shown the danger, or at least the uncertainty, of soundings on a direct course—uncertainty caused by the lay of the bottom. As we cannot change this, we must modify the course, bending it to the requirements of the bottom, if we wish to find in sounding a means of determining exactly the position of the ship, whatever may be the error attributable to previous navigation during the voyage, or due to the prevailing current on approaching the coast.

I will *enact* a position assured to within two or three miles. To ask more in thick weather, except in localities particularly arranged, would not be reasonable. It is sufficient if the error is not dangerous.

Let us trace very carefully and distinctly upon the U. S. Coast Survey, Chart No. 8 (Gayhead to Henlopen), the 15-fathom, 20-fathom and 30-fathom curves. Let us suppose a vessel, which is estimated to be at a distance of 150 miles from Sandy Hook, in latitude 40° 25′ N. Let us allow her an error of 15 minutes to the northward or southward, and in her longitude whatever easterly or westerly error we choose. This vessel is heading magnetic west. (Plate No. 5.)

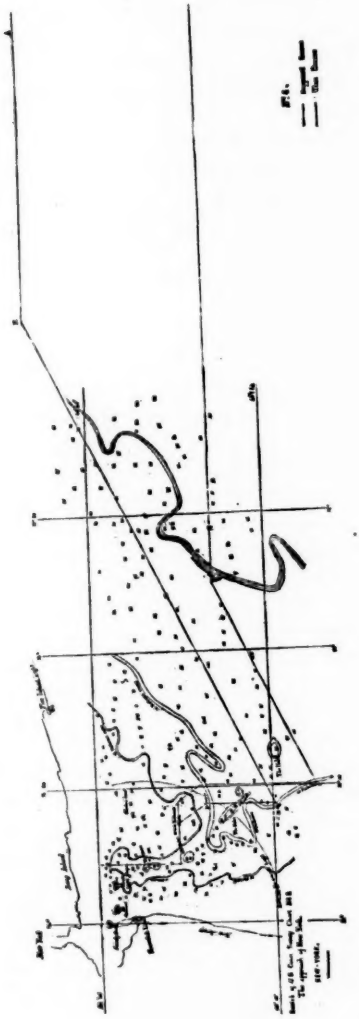
The indefinite geometrical space of her position will be limited to the northward by 40° 40′, and to the southward by 40° 10′. Let us allow this vessel to run to the westward until she reaches a depth of 28 or 30 fathoms, and then to head magnetic S. 65° W.; the soundings will diminish progressively and she will arrive on the 20-fathom line.

During the run S. 65° W., the geometrical space of the ship will be B C B′ C′; when she shall have arrived at 20 fathoms this geometrical space will have become C C′, a simple line.

At this time the latitude will be between 40° and 39° 52′, and the longitude between 75° 49′ and 75° 54′ (from Paris), whatever may have been the primary errors in these two elements.

By the simple changing of course at the first sounding of 28 or 30 fathoms, and the knowledge of the line of 20 fathoms, the large indefinite surface A B A′ B′ will have become a line of little width, and the error in longitude will not exceed 6′ or 7′.

Steering magnetic northward after finding C C′, the ship will find the soundings increasing until she finds a second time the 20-



fathom curve on its other branch in D D′. But the route pursued to the northward, inscribed in the new geometrical space C D C′ D′, will show the positions of the two 20-fathom soundings—one will be on C C′, the other on D D′. The latitude of the last will certainly be 40° 11′ or 40° 12′, a difference of only 1 minute, and the longitude will be determined to within 1′ or 2′. The error produced by the current on the short run to the northward will be inconsiderable.

From D D′ the route can be continued in all security to the lightship. Let us notice that:

1. In the vicinity of D D′ the 15-fathom curve is very near the 20-fathom one, and surrounds a plateau, included within the range of the Neversink lights, on which we find from 11 to 12 and 14 fathoms of water.

2. This same 15-fathom curve surrounds a depression which extends to the lightship, and in which, in greater depths than 15 fathoms, "the holes" are to be found.

We must get into this depression, which runs almost north and south. Leaving D D′ on a cruise N. 35° W. (true) and running 6 or 7 miles, we find ourselves on the flats in less than 15 fathoms of water. If it is blowing heavily this is a good place to wait for a lift in the weather, being certainly within range of the lights.

If, notwithstanding the fog, the weather is fine, we may continue on towards the lightship, running magnetic west, taking the precaution to sound frequently in order not to overrun the depression.

At the first good sounding of more than 15 fathoms (from 16 to 32 fathoms, perhaps), steer magnetic north. On this course the lead will give over 15 fathoms until very near the lightship.

As soon as the soundings are in 13 or 14 fathoms of water we can anchor with the certainty that we are in the vicinity of the lightship, ready to cross the bar as soon as it clears off.

A B A′ B′, looking for bottom in 28 or 30 fathoms, the reckoning placing us in those depths, the lead continues to give more water; we can conclude then we are very much to the southward (perhaps to the southward of 40° 10′). We must then steer magnetic W. N. W. until the soundings are as required. We will then enter the space B C B′ C′. Then steer S. 65° W.

On the northerly course, in C D C′ D′, we will perhaps cross the little depression of 19 and 20 fathoms, which is near the 37-

fathom hole. If we should happen to sound in it we could not mistake it for D D′, as the depths increase after crossing it. This sound would act more as a guide than as a drawback.

1. I have not spoken of the mudholes which may be found when sounding; these holes are an excellent guide, and when one of them is found we must profit by it; but to look for them would be a long and delicate operation; whereas we are always sure of finding a line normal to the one which we are steering. The trick is not to overrun it, and this only requires proper attention.

2. The first 20-fathom sounding which is reached on C C′ is more than 20 miles from the shore; we can, therefore, run for it without danger, however great may be the error of our reckoning.

3. The nearest course to the land (that which runs to the northward in the depression) is exempt from danger, as it is parallel to the shore, and when it is reached the position is sufficiently assured.

4. I have twice run in by this method—May 8th, 1877, and March 14th, 1878. On May 8th, left at 8 P. M. a position by reckoning 17 miles out. Soundings placed me at 11 P. M. in 3 hours 2 miles only from the position given by excellent cross-bearings. On May 14th, arriving on soundings without observations for the past two days, I ran by soundings alone to within three quarters of a mile of the lightship. In these two experiments I chanced to get a sounding in the 37-fathom hole situated between C C′ and D D′.

In all which precedes, we have supposed that the vessel arriving found thick weather out at sea, but it often happens that the fog occurs only some hours or even some minutes before the time at which we expect to make land or Fire Island light, that is to say, when we are within the 30-fathom curve.

This is, in my opinion, the most unfavorable case, as we have not prepared our base of sounding.

Under these circumstances, as in others, the only way of guaranteeing oneself with certainty is to run for 20 fathoms on C C′ *however disagreeable* it may be not to continue our course when so near our object.

We suppose the ship in latitude 40° 25′ by reckoning, according her the same error of 15′ in one direction or the other. We will cite two cases:

1. At the time that the fog occurs, in over 20 fathoms of water, by sounding (between 21 and 27, for example).

Continue the course west until we reach 20 fathoms (E. N. E. branch of the 20-fathom curve), then steer true south for 10 miles, and thus re-enter the space B C B′ C′, then steer S. 65° W. in order to find C C′.

2. When the fog occurs the sounding is less than 20 fathoms. Steer south (true) until we cross the E. N. E. branch of the 20-fathom curve. From that sounding continue 10 miles to the southward, then steer S. 65° W., as before, to find C C′.

As the figures denoting the soundings on the American charts are in English fathoms, we have adopted that measure in the preceding article.

TERRESTRIAL MAGNETISM.

[Communicated.]

No. 1.—On the Secular Variation of the Magnetic Needle at London since the year 1580.

From an examination of the movement of the compass-needle producing declination at London, I find that the various vicissitudes the needle has undergone during the last 300 years, can be explained by supposing that its movements have been governed chiefly by those of a *strong* magnetic pole revolving round the pole of the earth in about 500 years. I may here state that, in order satisfactorily to explain all magnetic phenomena, four magnetic poles appear to be necessary.

Let M N (fig. 1) be a compass-needle at London, directed to the true north, O. In the year 1660 that was its direction; in 1580 it was 11° 17′ E.; in 1816 it was 24° 17′ W.; and in 1877 it was 18° 57′ W.

Along the arc W A E, mark off A E = 11° 17′ to the east of A, and A W = 24° 17′ to the west of A, and let A be at the point which marks true north direction.

Let lines M E, M A, M W, be drawn and produced to meet in D O and C, a concentric arc drawn through the north pole, O.

Describe a circle C D D through the points C and D, M D and M C being tangents.

From E to W mark off all the different positions of the needle in its westward movement from 1580 to 1816, and let the lines be continued to meet the circle along D N C.*

Along the arc P R mark off the positions of the needle moving to the east since 1816, and let the lines combine to meet the circle in C H.

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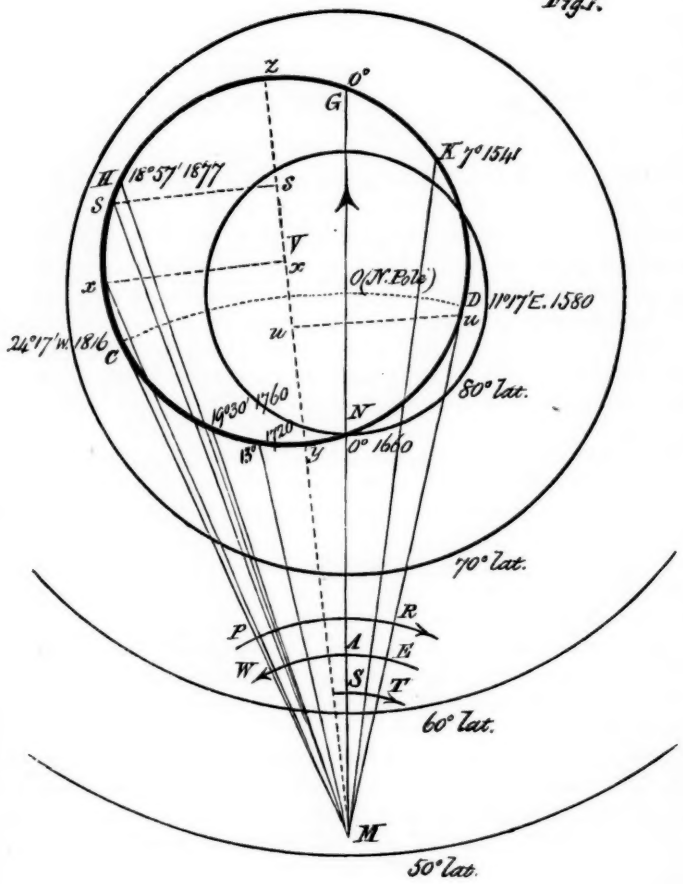
* Only the chief positions are given in the figure.

Fig. 1.


Z
0°
G
K 7°1541
H 18°57′1877
S
S
V
x
x
O(N.Pole)
D 11°17′E.1580
u
u
24°17′W.1816
C
80° lat.
19°30′1760
15°
1720
N
y
0°1660
70° lat.
P
R
A
E
W
S
T
60° lat.
M
50° lat.

Along S T mark off the position of the needle moving east before 1580, and let the line be produced to meet the circle in K.

Now, it has been observed that the needle moved very slowly about D and C, the points of eastern and western declination, and not only so, but the movement gradually decreased as it approached and gradually increased as the needle receded from the points D and C. Such would be its movement, if the needle be supposed to point constantly to something moving along the circle D N C H.

It follows that when that which directs the needle came to the point N on the circumference, the needle would point due north, and there would be a line of no declination passing through London. This actually happened in the year 1660.

It follows that the greatest movement of the needle would be when it pointed to V, the centre of the circle, and also before and after. Now during the thirty years from 1670 to 1700 (the needle pointing to V about the year 1685) the average rate of movement was 15′ a year—a rate considerably greater than that of any other period since observations have been made; indeed, it was nearly double the average rate since 1580, which is about 8′.

It follows that places to the east of London, as Königsberg and Copenhagen, would have the line of no declination, which passed through London in 1660, pass there about 1600 and 1620; and such was the case.

It follows that when the magnetic pole was at G, a line of no declination passed through London, traveling west, about the end of the 15th century. There is, of course, no record of such for London, but we do know that in 1402 Columbus found it east of the Azores. What has become of this line of no declination? I shall show when I treat fully of such lines.

It follows from the figure, that the needle at St. Petersburg would be nearly stationary from 1722 to 1774, as the magnetic pole from that place would appear to be moving in almost a straight line. Why there is such a small amount of westerly declination at St. Petersburg I shall show when I treat of the declination at that place.

It follows from the figure, that the needle at New York must have moved very slowly during the time between 1686 and 1723, and at a much more rapid rate between 1789 and the present time. I find

XUM

that in the former period it moved at the rate of only $2\frac{1}{4}'$ a year, in the latter period at double that rate.

It follows, if this theory is correct, that the magnetic pole must have been not far from 90′ west longitude when the needle at London had its greatest westerly declination in 1816. Now, Sir James Ross, in 1830, found the magnetic pole in 96° 43′ west longitude. The needle in London in 1830 pointed to about 96° west longitude; the pole was discovered to be in the same longitude. Supposing the pole to have traveled at the same rate since, it would be now about 115′ west longitude. In confirmation of this, I may say that a needle at London pointing to 114° 45′ west longitude would have 18° 50′ westerly declination. This is the declination of the needle at London at the present time.

It may then be reasonably concluded that the magnetic pole will now be found in latitude 72° 15′ N., and longitude 114° 45′ W., or in the middle of Prince Albert Land.

It will be seen from the figure that while the needle passes from C to G it is retracing values it had when it moved from N to C. If, therefore, we find the positions of the needle the same number of years before and after 1816, they ought not to differ much.

Take 38 years before and after 1816:

816	24° 17′	1816	24° 17′
1778	22° 11′	1854	22° 00′
38	2° 6′	38	2° 17′

These differences, 2° 6′ and 2° 17′, agree very well.

Or, suppose we take a much longer period, say 60 years:

1816	24° 17′	1816	24° 17′
1756	18° 50′	1876	19° 8′
60	5° 27′	60	5° 9′

These differences, 5° 27′ and 5° 9′, are very close for such a long period as 120 years—60 before and 60 after 1816.

From an examination of the movement of the needle along N C, it would appear that about 1892 the western declination will be 16° 10′ W., that it will decrease slowly till about 1905, will increase slightly for the next 20 years, and after 1925 will begin to move along rapidly, reaching the point G and the declination becoming

0° about 1990. Continuing its course eastward, about the year 2072 it will arrive at the point D, where it was in 1580, having made a complete double oscillation and the pole a complete revolution in 492 years.

We know that in the year 1541 the needle had about 7° east longitude and was at the point K. Now, from K round through N to H is about two-thirds of a circle. The magnetic pole has therefore to pass over the distance H G K (about one-third of the circumference) before completing a revolution.

The space K N H has been traversed in 336 years; at the same rate H G K will be traversed in about 168 years. Therefore the time of performing one revolution will be about 504 years, which confirms what has been already shown, that the magnetic pole makes one revolution in about 500 years.

No. 2.—On the Dip of the Magnetic Needle at London since 1576.

Having shown that the declination-needle in its secular movement, as observed for the last 300 years, is always directed to a magnetic pole which appears to revolve round the north pole of the earth in about 500 years, I purpose strengthening this conclusion by adducing the evidence afforded by the dip. This evidence will besides show, in the clearest manner possible, that the north end of the needle is, contrary to the belief and teaching of the last 300 years, a north pole, not a south pole.

Let a plane cutting the earth be supposed to pass through V (fig. 1), the centre of the magnetic polar curve, and through M, or London, where the needle is supposed to be; and on *z* V M project the positions *u*, *x* and *s*, of the magnetic pole, in the years 1576, 1833, and 1866, as indicated by the position of the needle.

Let the section resulting from this plane cutting the earth be represented by *z* M (fig. 2). Let *e* be the centre of the earth and *e r* a radius at right angles to the semi-axis, N *e*. The positions *u*, *y*, *x*, *s*, *z* (fig. 1) of the needle will be represented in figure 2 by the same letters. M is the position of London, and *h o* is a dipping-needle there in a horizontal position.

Now, if the needle dips *to* the magnetic pole (even supposing it to be in the same position in which Sir James Ross found it in the

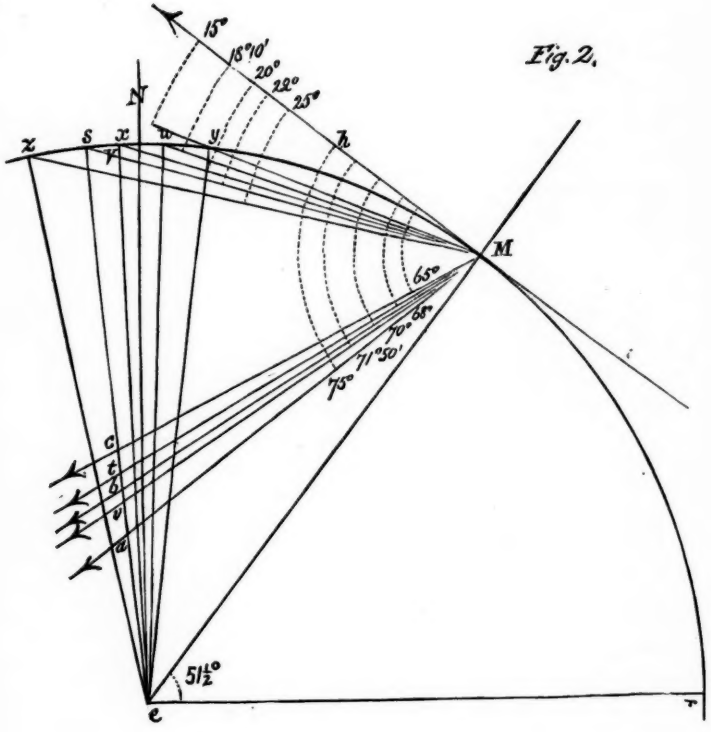


Fig. 2.

year 1833), it ought to dip to the position x (figs. 1 and 2); but even then the angle of dip would be only about 20°, whereas the dip at that time was about 70°. Now this angle, 20°, is the complement of the dip, and this is an important clue to the solution of the matter.

Suppose now the needle to dip to the several positions which I have shown in fig. 1 the pole would have, if it were in revolution. With the pole near the position Y, where I have shown it was at the beginning of the 18th century, the dip would be (fig. 2) 15°; but this is the complement of the real dip at that time—75°.

With the pole at the position U, where it was about 1566, the dip would be about 18° 10′; but this is the complement of 71° 50′, the actual dip at that time, as found by Norman.

With the pole at the position X, where it was about 1833, the dip would be 20°; but this is the complement of 70°, the true dip at that time.

With the pole at the position S, where it was in 1866, the dip is 22°; but this is the complement of 68°, the real dip at that time.

And to look into the future, with the pole at Z, its farthest position from London, where it will be about the middle of the 20th century, the dip is 25°, which is the complement of 65°. This, I hold, will be the least angle of dip, from which time the dip will begin to increase, until the pole has reached Y, when it will be at a maximum. Thus we have the range of the dip at London 10°, from 75° a maximum to 65° a minimum. Now we know that in 1680 the dip was 72° 30′, and approaching a maximum, which it reached early in the 18th century. All this is fully borne out by supposing that the magnetic pole revolves round the pole of the earth in about 500 years, as was proved by the declination.

But to return to fig. 2. Ma, Mv, Mb, Mt represent the actual directions of the dipping-needle at London about 1720, 1576, 1833, 1866. The needle being a dipping-needle, and the universal belief being that its north end is attracted by the north magnetic pole of the earth, it ought certainly to be drawn to point to the north end of the earth; but so far from this being the case, it seems to be repelled from it, and repelled it is, I hold.

There comes, then, this very natural inquiry: Have we, for hundreds of years, been maintaining that the end of the needle which

is directed to the north is the south pole of the needle, and upholding that which is the very opposite of fact? Every unprejudiced mind will admit that it must indeed be so. Indeed, the facts, when properly understood, are found to be in full accord with the great magnetic truth that like poles repel, unlike attract.

If the dipping-needle be taken to the arctic regions, it will be found in one locality to point to the ground, to be nearly perpendicular. It should be borne in mind that Sir James Ross never found it truly perpendicular, which itself would tend to show that the magnetic power was not *in* the earth. If the dipping-needle is repelled from the pole at London, much more will it be repelled in Boothia, and it is repelled as much as it possibly can be. The north end of the needle is repelled from the pole which is in the atmosphere, and the south end of the needle is as much attracted by the same pole; and this is as it should be—the north pole of one magnet (the terrestrial) attracting the south *pole* of another.

If the north end of the needle is a south pole, as it points to the ground, this should be because it is attracted. If it is attracted, it is attracted by something in the crust or at the centre of the globe. If there is something in the crust which attracts the needle in Boothia, it ought to attract the needle in London; but the needle at London is attracted neither to the crust at Boothia nor to the centre. The magnetic pole, then, appears to be in the atmosphere.

The fact that the declination-needle points constantly to the magnetic pole does certainly seem to indicate that it is attracted; but it is impossible to believe this, when the same needle and the same end, dipping, is manifestly repelled. The true explanation of the *apparent* attraction is, I believe, this: the needle places itself in the magnetic meridian as in a position of equilibrium, which the moving magnetic pole is constantly disturbing.

Even the north end of the declination-needle manifests a certain amount of the repulsion produced by the north magnetic pole of the earth, which is shown by the north end becoming apparently heavier directly it is magnetized. It is impossible to believe that the mere touching a needle with a magnet can give it weight. We are, then, driven to the conclusion that the north end must be attracted or repelled. Norman arranged the needle so that it should move freely in a vertical direction, and discovered that this

apparent heaviness was really a dipping. I have shown that the dip is produced by repulsion.

As the declination-needle was known long before the dipping-needle, such a universal belief got abroad that the north end of the needle was attracted by the north magnetic pole because it pointed to it, and that therefore that end of the needle must be a south or austral pole; that, when the dipping-needle was invented, it never occurred to the acutest minds that the same end in the dipping-needle was proclaiming in the most distinct manner that it was not attracted, but repelled—that it was not an austral pole, but a boreal one.

In conclusion, I would remark that it is admitted that the phenomena of terrestrial magnetism are most satisfactorily explained by four poles—two in the northern and two in the southern hemispheres, as maintained by Halley and Hausteen. I hope to show, hereafter, that the two magnets, as it were, having these poles, are not in the earth, but in the atmosphere; that instead of two rigid magnets in the earth, whose extremities come to the surface near the poles, there are two broad atmospheric magnetic belts extending from the neighborhood of the north pole to the equator, and two similar belts coming up from the south pole to meet them—the austral magnetism of the northern belts uniting with the boreal magnetism of the southern belts along the magnetic equator; the magnetic poles in each case being the free extremities of the magnetic bands. These bands revolve, at slow and unequal rates, round the poles of the earth, producing the secular variation.

It is of the first importance, then, that it should be clearly settled whether the magnetic pole, which Ross fifty years ago discovered in Boothia, is still there or has moved to lat. 72° long. 115° W.

B. G. JENKINS, F.R.A.S.,
London.

ARCTIC MEETING AT CHICKERING HALL,

JANUARY 31, 1878.

RECEPTION OF THE EARL OF DUFFERIN.

PAPER BY CAPTAIN HOWGATE,

ON HIS PLAN FOR THE EXPLORATION OF THE ARCTIC REGION.

ADDRESSES BY

CHIEF JUSTICE DALY, WILLIAM CULLEN BRYANT, BAYARD TAYLOR, LORD DUFFERIN, AND DR. ISAAC I. HAYES.

The objects of the meeting were the reception of the Earl of Dufferin, K. P., K. C. B., Governor-General of Canada, and the consideration of Captain H. W. Howgate's plan for the exploration of the Arctic. Among the prominent gentlemen upon the stage were Chief Justice Daly, Lord Dufferin, William Cullen Bryant, Paul B. Chaillu, Bayard Taylor, General George W. Cullum, Professor T. Sterry Hunt, Albert Bierstadt, Professor W. Wright Hawkes, Walton W. Evans, Francis A. Stout, Colonel C. Chaillé Long (Bey), Chief Justice Curtis, Harlow M. Hoyt, Professor James T. Gardner, Luther R. Marsh, Samuel Sloan, William Remsen, Lieutenant Greeley, and Colonel William Ludlow, U.S.A.

The formal business of the meeting having been disposed of, Chief Justice Daly said: I have great pleasure, in behalf of the Council of the Society, in reading the following resolutions:

Resolved, That the American Geographical Society extends to Mr. Stanley its cordial congratulations on the successful completion of his trans-African journey, attended as it was with so much peril to himself and followers, and so fruitful of valuable geographical results.

Resolved, That the four journeys of Mr. Stanley, in Africa, are so intimately associated with the liberality and enlightened action of our Fellow, James Gordon Bennett, Esq., that this Society cannot forbear to express its appreciation of his great services to geographical science.

Ordered, That the foregoing resolutions be placed on the record, and copies be transmitted to Messrs. Henry M. Stanley and James Gordon Bennett.

The resolutions were adopted without a dissenting voice.

JUDGE DALY'S ADDRESS.

Judge DALY then said:

The Society is convened, ladies and gentlemen, to consider Captain Howgate's plan for the exploration of the arctic region, and it is most appropriate to this polar evening that we have united with it the presence of his Excellency the Earl of Dufferin, Governor-General of Canada—himself a traveler, and author of one of the most sprightly and pleasant books that has ever been written upon traveling in high latitudes. [Applause.] Captain Howgate's plan will be laid before you. It will be explained in his own words, and I shall, therefore, make but a very few remarks in answer to a question that has been constantly put to me—"Why should we try to reach the north pole? Why send out costly expeditions involving peril to life and property when we all know that the approach to the arctic zone is surrounded by insurmountable barriers?" If it involved nothing more than the feat of reaching the pole it would be very difficult to answer such questions; but the general answer to them is that there is no portion of the earth's surface where observations in respect to scientific matters affecting the whole globe—every part of it—are so important as in the polar basin or its vicinity. The tremendous forces which are there at work, and which are the cause of the difficulty of exploration and observation, are physical phenomena that it is most important to observe and study. They have to do with the winds, ocean currents, magnetic influences and numerous other questions of the most practical nature in their application and in the results to which they lead. The amount of knowledge which has been discovered in this world by accident is small in proportion to that which has been the result of previous investigation; for what frequently is accident in its immediate discovery has been brought about by, or was the consequence of, previous inquiry. Our time this evening will not admit of any detailed statement of the numerous scientific subjects upon polar exploration which will shed light; and it is less necessary, as Professor Loomis, of Yale College, Dr. Hooper, of London, and the late Admiral Sherard Osborn have not only elaborately enumerated them, but have explained why they must be studied in the polar region, where nature

is at work on the grandest scale. There, and there only, in all probability, will the key be found to unlock these mysteries, especially in respect to the laws of one of the most important and universal of them, at least as it affects our globe—magnetism. All know that magnetism is a polar force, that it directs the needle which guides the seaman over the ocean, that it pervades everything upon and around our earth; but it is only the scientific man that knows the innumerable difficulties that beset the investigation of its laws and how important to the world is a thorough knowledge of those laws. But when you propose to get up expeditions for the acquisition of scientific knowledge, there are many minds that want to know in advance what the exact practical result will be, and they are apt to exclaim, "Well, what's the use of it?" The best answer ever given to this query was that given by Dr. Franklin when, by the very simple experiment of flying a kite, he had made the important discovery that the phenomenon which the Greeks obtained by rubbing pieces of amber, and which was then known under the general name of electricity, was one and the same thing with the lightning. He was one day asked, "Well, what is the use of your discovery?" Franklin's answer was this: "What is the use of a child? Make it of use."

When Franklin had taken this first step toward harnessing the lightning, bringing it under our control and adapting it to the uses of man, his discovery was, from a scientific point of view, as he expressed it, a child. To-day, in connection with the telegraph, it has made Puck's boast to put a girdle round the world in forty minutes a reality. If the questioner could have been told then that ninety-two years afterward the scientific child of Franklin would be turned into a means by which a merchant in Philadelphia, upon coming to his counting-room in the morning, could inquire in Bombay or Canton what was the market price that day of tea or silks, and, receiving a reply, could give his orders for purchases to be made in those distant places before he went to his home in the evening, the gentleman would have appreciated the significance of Franklin's remark, "Make it of use." The most ordinary things in our present civilization owe their origin to what in their day was scientific information, and they are due to the close observation and patient labors of men who could not themselves have predicted the great results that followed their researches.

Having thus, ladies and gentlemen, very briefly stated the object —the generous object—of continuing exploration in the Arctic, it affords me very great pleasure to introduce to you Lieutenant Greeley, of the United States Army and of the Signal Service Bureau, who is to accompany Captain Howgate as one of his officers in the proposed expedition, if it shall be sent.

Captain Howgate not being present, the manuscript of his plan for polar discovery was read by Lieutenant Greeley, U.S.N., in the following language:

PLAN FOR THE EXPLORATION OF THE ARCTIC REGIONS.

The plan of arctic exploration and discovery, in furtherance of which I have the honor of appearing before you this evening, is one to establish a colony of hardy, resolute and intelligent men at some favorable point on or near the borders of the polar sea, and, providing it with all modern appliances for overcoming the physical obstacles in the pathway to the pole, and for resisting the effects of hunger, of cold and of sickness, to deprive it of the means of retreat except at stated periods of time. The location selected as the site of the proposed colony is on the shore of Lady Franklin bay, near the seam of coal found by the "Discovery," of the English expedition of 1875.

The idea of establishing such a colony is not a new one, as it was advocated by Dr. Hayes as far back as 1862, and has since that date been approved by this Society and by the action of foreign societies and explorers. This fact accounts, in great part, for the almost unanimous support with which the so-called Howgate plan has been received.

The results of the last English expedition, and modern improvements in means of locomotion and communication, render it possible to reside farther north than in the earlier days of arctic exploration, when sailing vessels were used.

The expedition of Captain Hall in the "Polaris" in 1871, and of Captain Nares in the "Alert" and "Discovery" in 1875, have shown that, by the use of steam, it is a comparatively easy matter to reach the entrance to Robeson's Channel, in latitude 81° north, and that the serious difficulties to be overcome lie beyond that point. Parties from these two expeditions have made fair sur-

veys 140 miles north of this point, leaving about 400 miles of unexplored region between it and the goal of modern geographers—the pole.

When Captain Hall reached the upper extremity of Robeson's channel, the lookout of the "Polaris" reported open water in sight, and just beyond the pack which surrounded the vesssel and impeded further progress. This open water was afterwards seen from the cape at the northern opening of Newman's bay; and it was the opinion of the crew of that ill-fated vessel that if she had been but the fraction of an hour earlier in reaching the channel they could have steamed unobstructed to the pole itself, or to the shores of such lands, if any exist, as may bound the so-called open polar sea. We know that they did not succeed, but were forced to winter almost within sight of this sea, and subsequently, disheartened by the loss of their gallant commander, abandoned the enterprise.

Where this open water was found, Captain Nares, in 1875 and 1876, found solid, impenetrable ice, through which no vessel could force its way, and over which it was equally impossible for sled parties to work.

These facts appear to show that within the arctic circle the seasons vary as markedly as in more temperate southern latitudes, and that the icy barriers to the pole are sometimes broken up by favoring winds and temperature. To get further north, or to reach the pole, prompt advantage must be taken of such favoring circumstances; and to do this with the greatest certainty, and with the least expenditure of time, money and human life, it is essential that the exploring party be on the ground at the very time the ice gives way and opens the gateway to the long-sought prize, fully prepared to improve every opportunity that offers.

The permanent colony should be furnished with provisions and other necessary supplies for three years, and should consist of at least fifty selected men mustered into the service of the United States, three commissioned officers and two surgeons; all to be selected with a view to their especial fitness for the work—young, able-bodied, resolute men, who can be depended upon to carry out instructions to the extreme limit of human endurance. An astronomer and two or more naturalists—to be selected by the National Academy of Sciences, and to work under instructions from that

body, but subject to such general supervision and directions from the head of the expedition as is customary at all posts in charge of an officer of the United States—should accompany the expedition. One or more members of the regular force should be competent to make meteorological observations, and to communicate by telegraph and signals whenever such communications become necessary. An annual visit should be made to the colony to carry fresh food and supplies; to keep the members informed of events occurring in the outside world, and bear them news and letters from anxious relatives; to bring back news of progress made and of a private character to friends; also, if necessary, to bring back invalided members of the expedition and carry out fresh colonists to take their places. In this way the *morale* of the colony would be maintained, and the *physique* of its members kept constantly at the maximum; and the knowledge that this annual visit would be made would do much to alleviate the discomforts of the long arctic night and the feeling of isolation so graphically described by arctic explorers.

Captain Hall spent eight years among the Esquimaux, and each year found himself better fitted to withstand the severity of the arctic circle, and the colony would, it is believed, in like manner become acclimated, and eventually succeed in accomplishing the long-sought end.

With a few strong, substantial buildings, such as can be easily carried on shipboard, the members of the colony could be made as comfortable and as safe from atmospheric dangers as are the men of the Signal Service stationed on the summits of Pike's Peak and Mount Washington, or the employés of the Hudson's Bay Company, stationed at Fort York, or elsewhere, where a temperature of 60° below zero is not uncommon.

A good supply of medicines, a skillful surgeon and such fresh provisions as could be found by hunting parties, would enable them to keep off scurvy and maintain as good a sanitary condition as the inhabitants of Godhaven, in Greenland. Game was found in fair quantities by the "Polaris" party on the Greenland coast, and by those from the "Alert" and "Discovery" on the mainland to the west, especially in the vicinity of the last-named vessel, where fifty-four musk oxen were killed during the season, with quantities of other and smaller game. The coal found by the "Discovery's"

party would render the question of fuel a light one, and thus remove one of the greatest difficulties hitherto encountered by arctic voyagers.

There seems to be little doubt that Lady Franklin bay can be annually reached by a steam vessel, as Captain Hall went as high as Cape Union, between latitude 82° and 83° with the "Polaris," and Captain Nares still higher with the "Alert." It is possible that the last named point may be reached with the vessel, in which case coal and provisions could be deposited there to form a secondary base of operations for the exploring party. If this latter can be done, the road to the pole will be shortened by about ninety miles in distance, and three weeks or more in time—two very important items. It should be clearly understood that the only use to be made of the vessel which it is hoped to obtain from the Government is in the transportation of the men and supplies to the location of the colony. When this is done, the vessel will return to the United States and await further instructions. To the expeditionary corps brought from the United States should be added a number of Esquimau families to serve as hunters, guides, &c., and also an ample number of Esquimau dogs, so indispensable for sledging and so useful as food when their capacity for work is gone.

The colony should be kept under the strictest discipline, and to this end should be formally enrolled in the military service, save, perhaps, the strictly scientific members. By discipline only can such control be exercised as will be indispensable to the successful prosecution of the work. One cannot read without pain the account of the "Polaris" expedition, where the bonds of discipline, only too loose before Hall's untimely death, were entirely relaxed after it. The first in command of the new expedition should be a man able not only to gauge men, but to control them, and the second should be like unto him. Enthusiasm and energy are desirable, but coolness of temper, firmness of rule, persistency of purpose, and a well-balanced mind, fertile in resources and expedients, are indispensable to success.

The outfit of the expedition should include, among other things, an ample supply of copper telegraph wire, to connect the colony at Lady Franklin bay with the subsidiary depot at Cape Union, and thence northward, as far as practicable. Copper wire is strong, light, flexible, and a good conductor, and can be worked while lying

upon the dry snow or ice without support. The necessary battery, material and instruments should be taken to equip the line, and the battery left permanently at the bay station, where, fuel being abundant, it could be kept from freezing. A special form of instrument has been devised for the expedition, by which the use of battery is dispensed with entirely, and it is possible that the recently discovered telephone may be applied to advantage. It should certainly form a part of the outfit. Much attention has been given to the possible use of balloons as a means of observation and perhaps of exploration. I am now in correspondence with distinguished aeronauts in this country and in France upon the subject, and a series of experiments has been instituted to determine the practicability of obtaining a suitable material for the covering of the balloons that will resist low temperature. Here, as elsewhere, the coal mine plays an important part, as by its aid the necessary supply of gas can be readily and quickly procured.

A few sets of signal equipments, such as are used in the army Signal Service, would also form an important part of the outfit, and all of the men should be instructed in their use, and in the signal code. Thus provided with means of communication, parties could move forward with confidence, as they would be able, when necessary, to call upon their comrades, who remained behind, for advice or assistance. The existence of coal at the "Discovery's" winter quarters determines the question of colonization and the location of the colony as a means of polar exploration; and the Nares expedition would have been a success if it had done nothing more than this. The failure of his admirably equipped expedition to reach the pole is, in a great measure, attributable to the abnormally cold season and the exceptional character of the winds, which had resulted in the formation of ice ridges running across the line of march, thus making progress difficult, slow and dangerous. It is reasonable to suppose, from past meteorological records, that these unusual conditions will not exist during the present season, and, indeed, may not occur again for several years. Instead of discouraging further effort, the result of Nares's expedition, from the causes named, should stimulate fresh endeavors, and hold out a fair prospect of success. In any event, the little colony on Lady Franklin bay during their three years' residence, besides having the opportunity of selecting an open season, and becoming thoroughly hardened and

acclimated, would have their work narrowed down to a common focus—the pathway due north. The work of the Nares expedition clears the way for the final solution of the arctic problem.

To carry out the plan thus briefly sketched, it is desirable to secure the use of a government vessel, and, inasmuch as its object is one of national interest, such other government aid as might be necessary and proper; and, accordingly, a bill to "authorize and equip an expedition to the arctic seas" was introduced in the House of Representatives on January 8, 1877, by Mr. Hunter, of Indiana, and referred to the Committee on Naval Affairs, from which it was favorably reported by Mr. Willis, of that committee, February 22, 1877. In the Senate the same bill was introduced by Mr. Dawes, and referred to the Committee on Naval Affairs, February 9, 1877. The pressure of other and more important business then occupying the attention of Congress and of the nation, prevented further action during the session, which closed on the 3d of March last. The subject was found, however, to be one of national and universal interest, and received the hearty commendation and support of former arctic explorers, of geographers, and of men eminent in the several walks of science, among whom I may name the distinguished President of this Society and the Hon. I. I. Hayes, both of whom have from the first given me their warmest encouragement and the benefit of their wide experience. Professor Joseph Henry, of the Smithsonian Institution, Professor Elias Loomis, of Yale College, President Potter, of Union College, Admiral Porter, of the Navy, the then Secretary of the Navy, and most of the officers and crew of the "Polaris," with many others, have given the weight of their names and influence in support of the enterprise in this country, while abroad I have abundant evidence of interest from members of former expeditions, notable among whom are Dr. John Rae and Captain Kennedy, of English fame, and Lieutenant Payer, of the Austro-Hungarian expedition.

As practical evidence of the interest felt in the subject in this country, a number of public-spirited and generous citizens, among whom, it is a pleasure to state, those of this city occupy the foremost place, having faith in the success of the Colonization plan as a means of arctic exploration, and believing in its ultimate approval by Congress, contributed from their private means a sufficient sum for the purchase and outfit of a small vessel to be sent to the Arctic

seas for the purpose of collecting such supplies during the ensuing winter as might be useful for the main expedition of 1878, if that expedition should be authorized. It was at first intended to limit the mission of this vessel to the collection of material only, but the opportunity for scientific investigation was so inviting, and the added cost incurred thereby so very trifling in comparison with the results to be attained, that space was made on board for two observers and their necessary apparatus. One of these observers was selected on the recommendation of Professor Elias Loomis, of Yale College, and instructed to pay especial attention to meteorological phenomena, while the other was selected as naturalist of the expedition by Professor Spencer F. Baird, of the Smithsonian Institution, from whom he received special instructions.

This vessel, the "Florence," sailed from New London August 3d, with a crew of thirteen men, all told, commanded by Captain Tyson, of "Polaris" fame, and reached the head of Cumberland gulf on September 13, where she has gone into winter quarters. Captain Tyson's instructions are to collect such supplies as his experience shows to be necessary for the use of the future colony; to join the vessel carrying the members of the colony at Disco next August; and in the event of its non-arrival to return to the United States.

There is reason to hope, from the knowledge and attainments of the two scientific gentlemen accompanying the "Florence," that the little vessel will, on her return, add no small quota to our knowledge of arctic cosmogony and phenomena. But however that may be, her loss or safety must remain a closed book to us for many months to come. What perils she may meet, what dangers dare, what obstacles overcome, we can neither know nor forecast, but she and her gallant crew are none the less in the hands of Him who rules the ice-bound waste as surely as He rules this crowded city, without whose paternal knowledge not even the sparrow falls.

To guard against possible delay, in the event of Captain Tyson's failure to reach Disco at the proper time, or without proper supplies, the Danish government has been requested to delay the shipment of furs from that point until the middle of August, in order that a supply may be purchased from that source if necessary.

As soon after the opening of the present session of Congress as practicable, the bill to authorize the expedition was offered in the Senate and House of Representatives, and in both referred to the

Naval Committee. The House Committee, through Mr. Willis, of New York, who from the first has been an active friend of this measure, has renewed its favorable report of last session, and the bill is now awaiting the final action of the House upon it. From the Senate Committee I have the assurance of a favorable report. Senators Sargent and McPherson, having immediate charge of the bill, have exhibited a gratifying interest in its success, and it is reasonable to hope for its final passage.

In Paris, M. de Fonvielle, who is well known as an accomplished aeronaut and man of letters, is making a series of balloon experiments for the benefit of the future colony, in the foundation of which he takes a lively interest, and the French Geographical Society, at its last regular session, formally expressed its approval of the plan. The Bremen Geographical Society, through its Secretary, Dr. Lindeman, had previously expressed a similar approval, and everything seems working favorably toward the accomplishment of the desired end ; even the mighty forces of nature and the changeful seasons appear to labor for the success of the expedition, for the present winter, of such unprecedented mildness, will undoubtedly retard the formation of ice in the polar basin, and leave a freer passage for the colony next summer up Baffin's bay to Kennedy and Robeson's channel. The great veteran explorer, Professor Nordenskjöld, and the favorable reports which he brings back with his expedition just returned, with the wonderful voyage of Captain Wiggins from the mouth of the Yenessei along the Siberian coast and through the Kara sea, all demonstrate that the open season has unsealed the ice of higher latitudes, and points to a favorable northward passage during the coming summer.

I have not touched this evening upon the vast interest to science which polar expeditions represent, and the important questions which they alone can solve, nor upon the geographical theories and arguments in support of the different routes that might be followed, preferring to leave the settlement of these subjects to more competent hands. The noble Earl who honors us with his presence this evening, and who has won distinction in arctic fields as well as in those of statesmanship, and Dr. Hayes, whose triumphs as an explorer have been supplemented by those accorded to the successful legislator, can tell us with the graphic tongues of eyewitnesses the wonders of the strange lands we seek to colonize, and whose hidden

secrets we seek to solve ; for both have watched the colossal or fairy shapes of mountainous icebergs with their changeful play of hues under the midnight sun, or the mighty arch of the aurora, with its trailing fringes of incandescent colors spanning through the long night of arctic winter the mystic sea of ice and silence. Their presence, and that of the other distinguished gentlemen who are announced to address us, and whose names are as familiar as household words wherever the English language is known or spoken, I hail as an augury of success, and I heartily join with them and you in doing honor to the name and achievements of our countryman Stanley, in penetrating the wilds of Africa. There is no city throughout the whole broad Union more suitable for such a meeting as the present—a city where the memory of Grinnell, the great and public-spirited merchant, is still green, and where so many others, their hearts as generous as their means were large, have given freely of their store to aid in arctic discovery.

All that is needed, in addition to the money asked for to equip the expedition, is the authorized use of one of the idle vessels and its crew to serve as a transport for the colony to the scene of action —making one voyage each year—and the authorized employment on this duty of fifty persons, whose compensation is already provided for in the several departments from which they would be detailed, and from which they could be spared for the required period without detriment to the public service.

In view of the great value of the geographical and other scientific results to be reasonably hoped for from such an exhibition, it does not seem that there should be any hesitation in acting favorably upon the subject, and at an early date.

Very respectfully,

Your obedient servant,

H. W. HOWGATE.

Remarks by WILLIAM CULLEN BRYANT.

At the conclusion of this paper Mr. William Cullen Bryant was next introduced by Judge Daly, and said:

I take for granted that no very direct commercial advantages are expected from exploring the region to the north of that domain over which the honored guest of the evening exercises the vice-regal power, nor that even the enterprise of Dr. Hayes, fertile as he is in expedients and hopeful in temperament, is likely to find in that quarter a safe and practicable path to the coast of northeastern Asia. But while commerce withdraws from the undertaking, science comes forward and takes upon herself the office of discovery. While one party of explorers are penetrating to the heart of the African continent, and threading the rivers and measuring the lakes that stagnate under the equator, we are to send out from this quarter a party to the arctic circle, where human life can exist only through a constant battle with the elements—a party to establish an outpost in what we may call the enemy's country—a post of observation from which science may make excursions and gather facts for future use. What we are about to do may be compared with the conduct of one who inhabits a palace, and who, after taking an inventory of the lower rooms, resolves upon ascending to the attic and seeing how the rooms in that quarter are furnished.

It is hardly worth while to discuss beforehand what will be the value of the observations about to be made by science in the region of which I speak. Small beginnings in science often lead to great results. He who first observed the properties of the loadstone, who saw it attracting the particles of iron from loose sand and clinging to rocks that contained iron ore, could have had no idea of the vast and almost immeasurable advantage which the navigator of the sea would derive from it when it should be applied to his use in the mariner's compass. When the laws of the electric fluid were first investigated, who was there that thought of the wonderful uses to which it might be put when tamed and taught to carry messages from pole to pole with the speed of light, and even to repeat the words and musical tones uttered over the wires on which it was running? Who thought that it could be taught to write, or to speak, and sing? * * *

So will it be, perhaps, with the discoveries made by those who observe the aspects and agencies of nature within the arctic circle. The mystery of the magnetic pole is to be solved. The phenomena of the atmosphere and of light in that region are to be observed and recorded. The beautiful meteor called the northern lights is to be observed in its birthplace and made to disclose its causes. The individuals of the animal and vegetable kingdom, such as exist in the waters or on the coasts of that desolate region, are to be made the subjects of familiar observation, and every particular relating to them duly recorded. What will yet be done with the facts thus gathered? Who shall say to what conclusions they may lead, or what secrets of nature they may open up to our view? It is said that necessity is the mother of invention, but quite as true is it that knowledge supplies invention with its materials, and that without knowledge invention only gropes and stumbles in the dark.

Remarks by BAYARD TAYLOR.

At the conclusion of Mr. Bryant's remarks, Mr. Bayard Taylor was introduced and spoke as follows:

I have been requested to discharge the honorable duty of calling the attention of the members of the Geographical Society to the presence here, this evening, of a gentleman whose distinguished position is not the only stamp of his many abilities. As the executive head of the great Dominion which nobly emulates us in carrying an unbroken belt of civilization from sea to sea, the Earl of Dufferin has a special claim to our welcome. In a political sense, we acknowledge him as the best of neighbors; and certainly no one of his predecessors has ever so frankly and cordially mingled with us in a social way. On this occasion, however, it is proper that I should chiefly dwell upon those qualities of his mind and those features of his experience which claim recognition from this Society. When we welcomed Dom Pedro II., a year and a half ago, it was not the monarch alone whom we received; it was also, without doubt, the most energetic and untiring traveler of this or any other age. Lord Dufferin is the only Governor-General who has personally visited every settled portion of the Dominion; and, in order to

accomplish this, he has rivalled the Emperor of Brazil in the extent of his journeys, without going outside of Canadian soil. He has been trained, by his former travels in the far North and the Orient, to appreciate the vast difference between hearsay and personal knowledge—a difference which enters into the secret of successful political rule. The power of observing clearly, correctly and rapidly —I might almost call it the perceptive instinct—is not an ordinary gift; but it is one which Lord Dufferin possesses in an eminent degree. When I visited Iceland in the Summer of 1874, my first impressions of the scenery immediately recalled his descriptions to memory. The transparency of the atmosphere; the exquisite effects of color; the faint, delicate, and, as he truly says, "gem-like purity" of the mountain outlines, were all there. No previous traveler mentions them—yet they are the leading characteristics of Iceland scenery. There can be no better test of description than the fact that the objects themselves suggest the author's words. During the same voyage Lord Dufferin passed beyond the field of travel, and fairly entered that of exploration. He is the only one present to-night who has seen Spitzbergen and Jan Mayen's Land; in fact, he is one of some half-dozen living men who have landed on Jan Mayen's Land, and stood on the base of that wonderful peak, nearly 7,000 feet in height, which feeds the lonely sea from its five broad torrents of descending ice. It is fitting that we should tender to him such appreciation as lies in our power; and I therefore move, Mr. Chairman, that His Excellency the Earl of Dufferin, Governor-General of the Dominion of Canada, be elected an honorary member of the American Geographical Society.

Speech of LORD DUFFERIN.

Lord Dufferin was unanimously elected an honorary member of the Society. He said:

In rising to respond to the very kind observations which have been made in my regard upon this occasion, I confess that my mind is disturbed by conflicting considerations. On the one hand, I feel I have not the least professional right or title to intervene

in the present occasion. On the other, I should be very sorry if I had not an opportunity of expressing to you how very deeply I feel the kind reception which has been extended to me on the present occasion. It is true some years ago I sailed toward the north and got as near to the pole as Washington is to Ottawa, but my voyage was as fruitless as the journey of the Peri to the gates of Paradise, and it had but a single feature in common with more serious explorations, namely, that I had to turn back again. But neither, indeed, was that journey of any use to science, nor was it fertile in personal adventures. All that I can claim is that I was able to establish the temperature of the sea in a certain section of the Arctic ocean which had never been explored by any vessel.

But at all events there is one capacity in which I feel I have a right to claim admission to these halls, and that is as a member of the great Geographical Society of London. Now we all know that geographers are brothers all the world over. To a geographer these lines of ethnological and political demarcation which divide nations do not exist. All countries to him are what Italy was once described as being—merely geographical expressions. The only heroes to whom the geographer gives a place upon his roll of fame, the only careers which he admits upon his calendar, are those noble spirits who, generation after generation, have braved privation and faced danger and even death in order that they might advance the cause of science, and point the way to their fellow-men to those secret lands and unknown regions of the earth which God has prepared from everlasting for the habitation and advantage of the human race.

It is, therefore, ladies and gentlemen, as a brother geographer only that I venture to address you, and I can assure you that we in England duly appreciate the efforts which have been made by this Society for the advancement of geographical knowledge. And we fully comprehend that if in any place on the face of the earth enterprise should be regarded and honored, it is on that continent that owes its discovery and its present glorious condition to the enterprise of the greatest navigator that ever furled a sail or took a bearing. Nor is it in the least necessary that I should assure you that the names of those navigators whom America has sent forth—the names of Kane and Hayes and Hall—are as familiar, and are as completely household names to us as are those of Franklin,

McClure and Belcher among you. And I am proud to think that the two great representatives of the Anglo-Saxon race have been so intimately associated in a common endeavor both to explore the mysteries of the Arctic ocean, and, as I may now add, the resources of central Africa.

But I feel that it is not in that capacity that I am really among you to-night. You will all remember that when Columbus, to whom I have referred, returned from his great discovery, he brought back with him, in chains, certain of the chiefs of the nations with whom he had come in contact, both as proofs of the truth of his narrative, and as specimens of the strange nationalities he had discovered. Our discussion to-night has been concerned with those snow-covered lands which lie beneath Arcturus, and are lighted with the radiance of the aurora. And I do believe that, if I am paraded before you to-night, it is because my friend, Judge Daly, wished to show to you a potentate whose sceptre touches the pole, and who reigns over a larger area of snow than any other monarch of the earth. [Laughter and applause.] But, ladies and gentlemen, here the comparison concludes, for you all remember that as soon as these unfortunate prisoners were brought into the presence of the gentle Queen, Isabella, she commanded their fetters to be struck from their limbs; but the fetters with which I am bound here have been forged by the kindness and hospitality and consideration of the American people wherever I have traveled through the States, and I fear that even your imperial mandate would fail ever to lose those chains.

Remarks of Dr. HAYES.

Dr. Isaac I. Hayes, the arctic explorer, having been called upon, said he had given proof of interest in the meeting by coming from an Arctic region, in other words, Albany, to attend it, but did not wish to be held responsible for the arctic storm which he had brought along with him. "I have been asked to take part in the proceedings—I don't know for what purpose, but that the President of the Society has kindly informed you that, if possible on my part, I am to enlighten you somewhat as to the geography of the North, and without wasting words or time in this connection, I will—since

I see we have a map here in front of you—invite your attention to a few geographical points, in order that you may be able the more clearly to fix in your minds the direction, the purpose, and the condition of Arctic geography at the present time.

"Now, this map explains itself; the centre of it representing the North Pole, around which is the Arctic sea, or polar basin—that great basin, bounded on the one side by the northern coast of Asia, and on the other by this great area, over which our kind friend, his Excellency the Earl of Dufferin, reigns with such satisfaction to us and to his people.

"It was my purpose to follow the track of Dr. Kane, and make my way westward, and follow that along northward, confident that I would be able to break through the ice reach, and cross the open polar sea. Now, I need not tell you I did not accomplish all that; but I did succeed, as Dr. Kane did before me, and I with him, in reaching the mouth of Smith sound; wintered there, as he had done before me, and near by latitude 82° looked out upon the open polar sea. Captain Hall, in 1872, had steam power, and made his way to latitude 82° 16′, some sixteen or twenty miles further than I had reached with my dogs and sled. In the same direction also followed Captain Nares, of the Royal Navy. This expedition reached the western side of Smith sound, and Lady Franklin bay and Grinnell Land, but up to that time I was the only man who had set foot upon those dreary wastes."

Doctor Hayes then pointed out upon the map various places of interest in connection with arctic exploration, and traced the routes pursued by many leading expeditions. Beginning with a brief reference to the voyages of the Icelanders and Northmen in the tenth century, he passed on to the first real voyages of exploration, which were made by the Cabots towards the close of the fifteenth century, when they entered Davis strait in their endeavor to find a northwest passage to Cathay. The efforts of the brothers Cotereal, and of the unfortunate Sir Hugh Willoughby, who perished while attempting to find a passage to the northeast in the beginning of the following century, were the subject of passing mention, and the speaker took up the first expeditions on which scientific investigations were made a leading object. These were the voyages of Frobisher, who discovered the entrance to Hudson's bay, and those of Sir Humphrey Gilbert and of Davis. Dr. Hayes

pointed out the track pursued by the unfortunate Barentz, the Dutch explorer, who perished while searching for a northeast passage. The voyages of Henry Hudson, who, in the beginning of the seventeenth century, was peremptorily ordered to "go to the north pole," received only a glance, as the speaker remarked that his audience was already familiar with the history of the bold navigator who discovered the great river which bears his name. Baffin came in for a share of the speaker's attention, as did also the exploits of Behring and other Russian explorers, including their famous sledging expeditions. The routes pursued by English explorers in the last century were carefully traced, and their theories discussed from the standpoint of Dr. Hayes's own experience. In this connection occurred the names of Phipps, Cook, McKenzie, and others. Coming to our own day, the speaker dwelt at greater length upon the expeditions of Ross, Franklin, Parry, Buchan, Belcher, McClure, Kane, and Hall; and finally reached the proposed expedition of Captain Howgate. He was asked every day, he said, whether he thought the plan of Captain Howgate a practicable one. In answer to this query, he most certainly answered in the affirmative. That he favored such a plan was known to many present, who heard him advance it before the Society many years ago, and before Captain Howgate's name was known in connection with it. Referring to his own latest expedition, Doctor Hayes continued:

"One of the vessels penetrated to 83°. From that point expeditions were sent to the northwest and east, and these most remote lands—the northernmost lands on the globe—were marked out. I have always firmly believed and contended that about the pole we will find an open sea—a vast area of water, which, in consequence of the continual intercommunication between the waters of the equator and the pole, maintains a general uniform temperature, varying from thirty-four to thirty-six degrees. Everywhere throughout the waters of the earth this prevails, the surface water only reaching a high temperature, sometimes on the equator reaching as high as 88°, and in the arctic regions a temperature not lower than 29°. Even with the lowest temperature we found the waves rolling as wildly as in the Atlantic. Water does not freeze unless quiet. I have in these northern seas seen the waves tossing freely, and without any ice found, when the temperature was 50° below zero. But when the tide and winds were stilled, and the surface

became calm, it was almost instantly covered with ice, so that you could walk safely where a few moments before was a tossing sea.

"But I did not intend to discuss the question of an open polar sea here. I will, however, remark that were it not for that wise provision of nature by which there is this equalization of temperature, which we might say was caused by the arterial circulation of the waters, that great area about the pole would be but one vast glacier. But it is not so; the water is never cold except upon the surface. At a certain depth it preserves a uniform temperature over the whole world.

"It is the intention of Captain Howgate to fit out an expedition to penetrate into these mysterious waters. Whether he shall find it an open sea remains to be seen; but if he does, it is proposed that he shall be provided with boats and ships fitted for the navigation of those waters. He will, on the other hand, go provided with sleds in case he shall find a sea covered with ice where Dr. Kane and myself found open water, and where Captain Hall found a great deal of open water; and I believe if the "Polaris" could have been pushed through the belt-ice and the waters around, the pole could have been navigated.

"Let me pause here a moment to analyze these conflicting reports from the same locality. I do not believe in any such thing as a palaeocrystic sea, as reported by Capt. Nares. Vast masses of ice are formed and gather in connection with the land. They may be called floating glaciers, and they are crowded by the winds and currents of the sea down upon the land, as the winds may prevail in one quarter for a long time. I believe that the barrier of ice which presented itself to Captain Nares was simply the result of a succession of gales which, lasting a long time, had crowded the ice down upon Greenland and Grinnell Land. It is the same condition of ice that I found upon the northern coast of Greenland in the Kane basin. Again, in 1868, when I presented the plan to you of polar colonization, I suggested that there should be sent out two vessels—one of them a sailing vessel and the other a steamer. These two vessels should make their way through the icy barrier of Baffin's bay to the mouth of Smith sound. It was there I passed the winter of 1860–1. We were able there to capture some 250 reindeer during the summer, and both sea and air were teeming

with animal life. It seemed to me to be a place where men could live safely and comfortably enough.

"There were vast beds of turf there, which would serve for fuel. We subsisted entirely by hunting, and had all that was needful to give us a comfortable variety. We subsisted upon the products of the region like the natives who dwell there. At this point upon Smith sound, then, I proposed to plant a colony, to land a sufficient number of men, and take with them from the southern part of Greenland some Esquimaux, with dogs and the paraphernalia of hunting, and let them seek game in the valleys. They would find seals and bears in the winter time, and wolves, which abound there. Thus they could obtain means wherewith to maintain the expedition.

"Now, this is a skeleton of what I presented to the Society many years ago, and urged upon its attention. But in order to carry out this plan there is one essential qualification, and that is, the place where the colony is founded must be as certainly accessible as Liverpool; and that position we have at the mouth of Smith sound. I regard Smith sound approachable with almost as little risk and danger and as great certainty as England, during any summer. To be sure, vessels have been caught in the "ice pack;" but it was while pursuing the long-exploded custom of hugging the land-leads, holding on to the shore-ice, and keeping inside always. I claim to be the first one to break away from that custom. In my little schooner I left the land and passed out into the middle of Baffin's bay, and the result proved the correctness of my judgment in that regard, for I crossed this "middle ice," a distance of more than 300 miles, in fifty-five hours—a voyage which has sometimes taken three months. On my return voyage I crossed the same bay before a gale of wind in forty-eight hours. I contend that a vessel can reach Smith sound without great or unusual danger. With two vessels, one might reach the mouth of Smith sound and land colonists. There I would leave the steam vessel at the harbor, and send the sailing vessel home with everybody on board that was not content to remain—the home-sick, the weary, the disheartened—and about half of them would be in the latter condition by the time they reached there, as I should judge from experience. Then I would start the steam vessel to the north if the season were not

too far advanced. The most favorable season is about from the 10th of August to the 10th of September. This would afford abundant time to plant the colony and start northwards with the steam-vessel. And here I will pause to make one slight criticism of Captain Howgate's plan. He proposes to enter Smith sound, and therein go directly to Lady Franklin bay, and make that the basis of his operations. Now, I do not regard it as altogether certain that you can reach Lady Franklin bay every year. * * * * I would make my base of operations the mouth of Smith sound, and after that Lady Franklin bay. The sailing vessel should go back to New York, and the next year bring out a new crew and cargo for the colonists. The sailing vessel could always reach them, and the expectation of her arrival would cheer the exiles, and sustain their courage through the dismal winter. The vessel would bring out new recruits. She would take home the sick and weary members of the party, and also the products of the hunt—the fur of the Arctic fox, of which we captured a great number; blubber from the seal, and walrus ivory, and seal skins and eider-down. We captured a considerable quantity of these. A good year, with skilled hunters, might yield $20,000 or $30,000 worth of valuable commodities. Perhaps the most important advantage of this plan would be the acquisition of new men every year. And here let me remark, as I go along, that no man, unless he be endowed with a peculiar ambition—unless his whole heart and purpose is in the achievement of a particular object, which will accomplish for him something "which the world will not willingly let die"—is good for anything after the first year. Captain Howgate must have new recruits every year. Nine men out of ten will be useless after twelve months have gone round, and one winter's campaign is over—that long, dreary arctic winter, when the sun never shines. We were at our harbor on Smith sound 125 days without seeing the sun. Nothing can be more disheartening and wearying than the gloom and solitude of that winter. Days and weeks come and go, and you look at nothing but a monotonous field of ice and snow; no new sounds greet the ear; you wake up each morning and meet the same countenances, and you grow weary, not only of yourself, but of everybody and everything around you. This creates discontent and dissatisfaction among the men. This feeling grew up among us everywhere, and it was

always productive of discord in the social circle; for all men have sharp angles of character that are very apt to make them objectionable. My experience, of course, has only been with a crew of men; with a shipload of women it might be different. [Laughter.]

"Science claims this expedition at the hands of the country, and of the Government. Let us send forth this colony of Captain Howgate's, equipped fully, and freely manned by officers of our own gallant navy, determined to perform this duty for the benefit of science, and the glory of their nation. Let us send them forth with a public opinion which will force the Government to provide an outfit, and let us have a cordial welcome for them when they return."

American Geographical Society.

No. 11 West 29th Street.

THE OBJECTS OF THE SOCIETY.

THE OBJECTS OF THE SOCIETY are to encourage geographical exploration and discovery; to investigate and disseminate new geographical information by discussion, lectures and publications; to establish in the chief maritime city of the country, for the benefit of commerce, navigation, and the great industrial and material interests of the United States, a place where the means will be afforded of obtaining accurate information for public use of every part of the habitable globe. The Society has been in existence twenty-six years. It has a geographical library of thirteen thousand volumes, and a large and very valuable collection of Maps, Charts, and Atlases relating to every part of the world. It publishes a Bulletin, an annual Journal, and co-operates and interchanges information with one hundred and ten domestic and foreign Geographical and other Scientific Societies.

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